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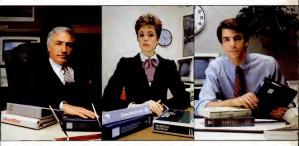
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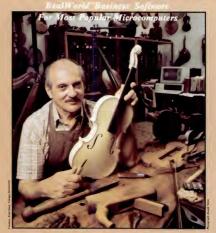
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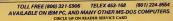
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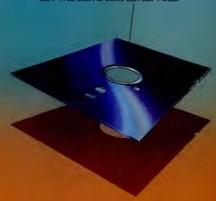
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What's Inside

A spy finds his way into PC's Toy Room and lives to tell the story. In this issue we compare the IBM PC with a supercomputer and come up with surprising conclusions.

n these high-tech times, it's hard for an honest, hardworking, computer magazine editor to make a living without running into problems that would make an IBM mainframe shudder.

Just the other day, I was called in on a top-secret assignment by the publisher of that well-known computer magazine, Marvy Micros.

"I hear that PC Magazine is doing an issue on the Cray," growled my boss, biting down on her cigar. "Go over to their offices and get the story."

I knew the only way to get past the guards at the IBM PC's top paper peripheral was to pretend I was a typical computer magazine editor. So a few hours later, wearing a blue pinstripe suit and thick black glasses, I strolled confidently into PC headquarters. I nodded at the receptionist, passed through the glass doors, and found myself in a maze of offices within offices within offices.

"Clever," I thought. "Only a true member of the microcomputer community would be able to negotiate this pathway. It probably follows the pattern of a memory chip, or something equally nefarious."

By following an unsuspecting copy editor, I finally found myself within the inner sanctum of PC Magazine. The place seemed deserted. I was puzzled and alarmed at the same time. Were all the staff members at an important press con-



ference at which a new development in microcomputer technology was about to be introduced? Or were the editors of the magazine actually permutations of the latest form of artificial intelligence?

Into the Toy Shop

My ears caught a faint murmur of conversation from some unseen office. I followed the sound to an ordinary looking door, on which was tacked a sign that read: "Anyone who removes anything from the Toy Shop stiff will have someone on the Toy Shop stiff will have all his internal organs ripped out!" This was obviously the right place.

The Toy Shop, as anyone who is in on

the secrets of PC Magazine knows, is the place where the magazine's elite hone their skills on the market's newest hardware and software.

I found the entire editorial staff of PC gathered there in conference. What luck! I slipped into the room, ducked behind a pile of manuals, and took out my tape recorder (which was hidden in the December 1983 issue of PC).

ber 1983 issue of PC).
Executive editor Mike Edelhart (who was wearing a brown suit and matching sneakers) was speaking.

"Crays are the fastest, most powerful computers in the world. We decided to compare PCs with Crays and determine just how powerful the PC is or isn't. "When you install the Cray, you don't

simply put it somewhere—it becomes the room. It looks somewhat like a dentist's office—totally innocuous, with low couches around it. The biggest difference between the PC and the Cray is that you can sit on the Cray."

One of the computers made an unpleasant sound. Edelhart shrugged and continued speaking.

"What you see is only a small part of the machine. The Cray goes through the floor. It requires a mainframe simply to handle the inflow and outflow of information. It generates so much heat that you could probably use it to smelt metal. And, to exist, it requires a specially constructed, environmentally controlled room. Installing a Cray is good for the local economy; it's like having a new industry come to town.

"In order to put together a comprehensive, informative issue, we tried to find people who had access to both machines. This was difficult, because there aren't that many Crays in the world, and most of them are owned by government agencies. But Paul has done a thorough job of investigating how the Cray and the PC measure up." continued Edelhart.

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Special projects officer Paul Somerson
had been stifting at one of the Toy Shop's
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Edu

"Comparing the PC to a Cray supercomputer is a little like comparing a Piper Cub to a Saturn V rocket. Both will move a handful of passengers from one location to another. The Saturn V costs a great deal move, takes years to learn how to fly, requires exponentially more ground support, and is powerful and fast enough to beat gravity. But it's not much pool for short hops. The piper will take you from New York to Bostonia failer than as the Centing gross national product of a small country, And, it can be flown by just about anyone once he learns the roces.

"It's difficult to wise objectively about something as site and powerful as the Cray X-MP, a machine so well engineered that its designers' greatest problem is the speed of light. So while a gee-whiz articule about all this certainly does exist, my article is an informative (and perhaps entertaining) glance at supercomputers; it should give PC owners some perspective on the powers of the PC."

Edelhant beaut nalkine awain. "Mi-Edelhant beaut nalkine savain." "Mi-

chael Hannah, at the Department of Energy's Sandia Laboratories in New Mexico, is responsible for training staff there, both to run the Cray and to run the PCs. They use the Cray for scientific mod-

PCs. They use the Cray for scientific modeling and for government contracts. They use the PCs for just about everything else. The staff members found that using the PC was, for some tasks, more valuable than using the Cray.

The biggest difference between the PC and the Cray is that you can sit on the Cray.

Common Ancestry

"Richard Basil, a computer historian from California, 2 corsus his opinion of the future of the PC and the Cray. If you think about it, he two computers and a common ancestor. They both began with a common ancestor. They both began with BNIAC and thrAVAC in the basements of universities at the end of World War II, and then two paths emerged. One side said, let's take this computer and see how small and easy to use we can make it. What resulted was the PC. The other said, this is the world's fastest computer; let's try to make if faster, and Faster, and

"So now we have two distinctly different families that will probably be reassived in the future. Eventually the Cary's going to bump up against the speed of lightmable to become sury faster. So, as the Pe becomes increasingly powerful, the Cray and the PC are going to more closer and closer together. In the next generation, you may be able to perform tasks over PC that are now only possible with the Cray."

I moved a little closer to the group. crboar Unfortunately, I had not noticed a stray them! PCjr. that had been perched precariously on the end of a nearby table. It clattered living.

noisily to the floor. I froze.

Michael O'Cone, the sharp-eyed technical assistant and, (as he puts it) "head ell" of PC, was the first to respond to the interruption. Instantly, he bent down, picked up the computer and examined it gravely. "Must have been the disk drive," he announced. The entire assembly nodded, and turned back to Edelhart.

Mission Partly Accomplished I had heard enough. I knew that I had to get back to my office to tell my boss what

was going on at PC Magazine.

I had no time to lose. I crept out of the
Toy Room and fled into the hallway. I
thought I would be able to find my way
out, but I got lost in the maze until I con-

vinced a secretary to give me directions.

Back in my boss's office, I reported on
the PC meeting and played the tapes. I
paused, waiting for the accolades and
offers of raises and promotions that would
certainly come my way.

To my surprise, my boas stood up, ground her cligar into my tage recover, and shouted, "fafet Why did you leave that point? I just got word that with Rosch, the contributing editor who writes hardware reviews, is a close Logo enthusists who has compared Harvard Associates? PC Logo from its beginning, have written an in-depth study of this Inguage."

And, this issue of PC includes articles on laser printers, on the companies that devote themselves to predicting what IBM will come up with next, and on microcomputer software that can create chips for other microcomputers.

I was flabbergasted. How could I have missed all that? Hanging my head in shame, I waited to be punished.

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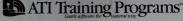


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FROM THE EDITORS OF PC

MAY 15, 1984

IBM Rapidfires PCs

Boca Raton speeds PC production and promises

Local Area Network that's more than Peanut Cluster to enhance office processing

BY CONNIE WINKLER

BOCA RATON, Fla.-IBM is burping out PCs one every 16 seconds, and by the end of the year they'll be rolling off the assembly line one every 7 seconds. Wow!

This will triple IBM's 1984 PC production over last year, Philip D. Estridge told 180 stock watchers visiting the Boca Raton PC birthplace for a recent New York Security Analysts meeting. Estridge, leader of the PC pack in Boca Raton, is president of the Entry Systems Division (ESD). IBM has never revealed offi-

cial PC production figures, nor does the tripling of production statement really help. However, analysts now suspect IBM will produce about 2 million PCs of all varieties this year.

To accomplish all this growth, ESD will spend \$500 million in 1984 on plant and fa-

cilities. The division plans to add a new production line to the four in Boca Raton and open another PC plant in Wangaretta. Australia, to serve the Near

East.

We continue to see orders for PCs and XTs growing-we don't see the beginning of the end to demand." For the PCir. however, Estridge said supply and demand were "relatively balanced," which many ana-

lysts interpreted to mean that PCir is not selling with the gusto of the PC.

New PCs? What about new versions of

the PC, perhaps one with multiuser capability running the UNIX operating system and based on an Intel 80286 (a chip. incidentally, in short supply).

The IBM speakers acknowl-

PCs Key In On Radio Signals

How receptive is your keyboard? Perhaps more so than you want

BY MARTIN PORTER Radio frequency interference

The IBM PC keyboard has a serious case of RFI, and it's got it bad.

(RFI) is a consumer electronics-as well as military and industrial-phenomenon whereby hair dryers, cordless telephones, even IBM PCs broadcast or receive radio broadcast signals that disrupt normal operations. In many instances this produces an audible noise that seems to be caught inside the system-for example, a police band playing over your home stereo receiver. In the Personal Computer it either crashes the system or causes the keyboard to transmit gobbledygook to the CPU, or noise to nearby electronics, according to reports from PC users.

PC owner Maurice E. White of Papillion, Nebraska, recently found his micro wreaked havoc on a \$40 cordless phone he had

Running Interference

Dear PC Magazine:

You must be receiving at least some inquiries concerning the PC and radio frequency interference (RFI) from amateur radio stations and roving CBs. If not, you will be. I live in the same house as a 1,000 watt amateur station and was, until recently, suffering spurious character generation and program crashes of the most disasterous kind

IBM's official line on this, via ComputerLand, was: "Our product is PCC-approved; please take a walk."

Of course, the amateur radio operator's equipment is also FCC-approved. Not only that, but his station consists of the newest ICOM equipment, custom-grounded 3 feet away, with cascading filters, beam antenna-the works.

As per ComputerLand's suggestion, I traded my EPD Lemo from Electronic Protection Devices for the EMI-RFI-proof Peach. No dice. ComputerLand called on IBM Boca for technical advice. IBM suggested a custom ground, beam antenna, tin foil wallpaper for my office, and "alternate operating schedules" for myself and the radio amateur. I found these suggestions less than helpful. With full testing cooperation from the ham (my father, who has been licensed for 40 years), I disconnected the modem, the phone line from the modem, the

edged that they're working with UNIX, but Estridge downplayed the 80286 possibilities. "It wouldn't make sense to build new products on parts we couldn't get," he said.

IBM's decision to manufacture Intel 8088 microprocessors (the heart of the PC) in-house was not a response to the parts shortage but an attempt to complement the "rest of IBMs business objectives," he said. "The parts shortage is pretty much behind us for the near term."

1BM will enhance the power and functionality of its networking capabilities, certainly

Radio Signals (continued) been given for Christmas. "As soon as I turned on my PC I thought the whole world was trying to ring me up.

In the case of Travis Charbeneau of Williamsburg, Virginia, the problem was especially severe since he lives in the same house as a 1000-watt amateur ham radio operatorhis father. This was no run-ofthe-mill ham radio rig. Charbeneau reports: it was custom grounded, used cascading filters, beam antenna, FCC-approved equipment-in short the works." This system would crash his PC, which, in turn, would take revenge by emitting "spurious" RF that blanked out the radio in the 21-28 mesacycle band. Charbeneau disconnected the phone line from his modem, and his RS-232 cable and printer from the processor, but he got no results

Charbeneau's ultimate solution oddly came at the suggestion of a IBM technical representative in Boca Raton, who asked not to be identified. He recommended a new keyboard -a Key Tronic 5150-which has, so far, done the trick.

Sources at Key Tronic in Spokane, Washington, say the company has received several similar reports that their 5150 is not bothered as much by RFI as the IBM keyboard. One Key Tronic customer, who installs PCs in radio stations, regularly customizes his client's micros with the Key Tronic substitute to alleviate the problem. Key Tronic has a free-lance technibeyond the Cluster products (announced with the PC Portable) that connect PCs, PCjrs, and XTs, with an XT as the file

server

The local area network would have much more power and function than the Cluster, said Estridge, adding, "Most of the technology needed to do this will be here this year." The Cluster, he said, is "an idea of what is yet to come." "We are spending a lot of dol-

lars in 'real LANs,' " chimed IBM president John F. Akers. IBM knows where its customers are headed with PCs because of its own employees.

cian currently investigating for an internal report why the product works while IBM's keyboard doesn't. Key Tronic declined to give more informa-

"We still hope to sell keyboards to IBM," explained Key Tronic keyboard marketing manager Joe Dooley.

An IBM spokesman said that

"Our use is a precursor to the use we can expect by our major customers," Allen J. Krowe, 1BM senior vice president and chief financial officer, told the

180 Wall Street analysts. Currently there are about 22,000 PCs installed within IBM, with about 55 percent connected to host computers. By year-end, 75 percent of the 60,000 installed will be con-

nected to large mainframe computers, Krowe predicted.

PC Growth

Both Akers and Estridge see the action moving toward software. Akers looks at bottom-

board caused problems with the cordless phones The RFI problem is com-

plex-and delicate-because of product certification by the **FCC (Federal Communications** Commission). FCC rules control the amount of radio waves that a computer can emit. There are two standards for commercial and home use. The home standard is more stringent than

reports of such RFI occurrences

were "minimal" and stressed that any capacitive keyboard may be affected by heavy fields of radio frequency interference. "That could include radio transmission equipment," he added.

"There's nothing wrong with our keyboard," said John Pope, information manager for the Entry Systems Division. Pope urged users having problems to

go to their dealers and that the dealers, in turn, forward the complaints to the dealer response center in Boca Raton. We do have a commitment

to service. We are concerned about our customers. If they have a problem we'd like to know about it." he added. Pope said he knew of no instances where the PC or key-

the commercial standard, because homes typically contain more devices sensitive to radio waves, such as radios, TVs, and stereos. The PC, like most personal computers, is certified to meet the home standard PC Magazine has learned that

both keyboards use interior conductive paint coating specifically to prevent RFI problems. However, one characteristic that might explain the difference is the distance between the Key Tronic componentry and the keyboard outer metal shell. Reportedly. IBM's micro. processors are closer to the

exterior than the Key Tronic replacement product. Yet another PC and ham radio user. Fred Cady of Bozeman.

Indeed, the challenge of developing follow-ons for the PC thickens. "You have to plan for the new to fit with the old. The equation becomes terribly complicated," Estridge said. Balancing what's new with

line results-over the last 5

years on a compounded growth

rate, IBMs software revenues

Estridge today counts 5,500

software applications for the

PC; for next year he predicts

have grown 42 percent.

what's some before also concems Akers at IBM's Armonk headquarters. "We have to avoid PC myopia," said Akers. Montana, attempted to solve his RFI problem by insulating his

IBM PC keyboard with metal

foil. It didn't work. Cady, president of Micro Electronic Systems, a producer of PC software for ham radio users, noticed: "The ham radio gets into the PC and the keyboard goes crazy somewhere in the 7-Mhz band RFI is a two-way street. A computer can generate it or be the victim of it. The high-speed electrical signals inside the computer can radiate out from wires and printed circuit traces in the machine in the form of radio waves. If uncontrolled, these waves can cause everything from a buzz in an AM radio to "snow" on a TV screen. Conversely, when radio waves get into the machine, they induce small electrical signals

"Most computers are not designed to work in a strong RF field," explained American Radio Relay League (ARRL) technical information specialist Bob Schetgen in Newington, Connecticut. "Most of the RFI that a computer generates comes from the bus lines or from the horizontal oscillator in the TV monitor. Much of this is solved by separating the computer and the radio by at least 10 feet, or by shielding the micro in foil."

onto the wires. When the radio

waves get strong enough, the

signals can confuse the com-

puter and cause it to crash.

Is the PC a particularly serious contributor to overall RFI pollution? Schetgen's reply: You probably get more interference from a hair dryer."

IBM-Merrill Lynch Venture Puts Brokers on 3270 PC

New company will use satellites for near-instant transmission of stock market data needed to "tickle" brokers to buy or sell

BY KAREN COOK

NEW YORK-IBM and Merrill Lynch, the nation's largest retail brokerage house, have formed a joint venture to bring un-to-the-second financial information to Merrill Lynch's account executives, with much of the data going via satellite. The system combines IBM-supplied 3270 PCs with state-of-the-art telecommunications and software from Merrill Lynch and Monchik-Weber

Although the new system has been in development for two years, the two companies have not yet named the new company or any of its executives. It will not be installed in Merrill Lynch offices until mid-1985, but it may eventually be marketed to other companies

"We want to turn the money manager of today into the information manager of the future, said Robert P. Rittereiser, executive vice president for strategic development at Merrill Lynch. The company is subcontracting its software from Monchik-Weber, a New Yorkbased financial systems de-

Rather than relying on slow modem transmissions to the 3270 workstations, Merrill Lynch plans to transmit the bulk of its market data via satellite. The 3270 PC will receive signals in much the same way that an ordinary TV receives broadcasts. Two-foot satellite dishes installed on top of buildings will receive encoded transmissions, then relay information via coaxial cable to the 3270 PCs at each location. The 3270 PCs will be specially equipped to receive. decode, and display data almost

At the announcement here. large demonstration screens blinked continuously with updates from the New York Stock Exchange ticker and the Dow Jones News/Retrieval service. The 3270 PC can receive and process information from up to four sources simultaneously.

The new system provides account executives with three important services, Rittereiser

· Decision support. In addtion to running the stock ticker in one of its seven windows, the 3270 PC allows users to create a special portfolio of up to 300 stocks that are constantly and automatically updated. Brokers under orders to sell if company A's stock goes below two can also program the computer to monitor A's stock price. If A falls below \$2, the PC will flash "LIMIT" in a "tickler" window.

"Decision support is active and intelligent," Rittereiser said. "It taps the account executive on the shoulder and says 'hey, take a look at page three.'

· Office automation. Using the 3270 PC's PC-DOS windows, executives can run standard PC packages, including spreadsheets and word processors. "This aspect is not exotic. It's not Buck Rogers. But it is a good step beyond what the AE is used to," commented Rit-

· Interfaces. The 3270 PCs are designed as part of a network that will link Merrill Lynch headquarters to regional and branch offices. Users can send electronic mail from office to office, or even to clients. The 3270 PC. Rittereiser explained.

can "alert an account executive to price changes, trading patterns, revised research opinions and news that may affect a stock's price and therefore prompt an investor to take action. A push of the button could then give the account executive a list of all customers affected. Finally, upon instruction, the computer will begin telephoning customers or contact them via electronic mail."

In recent months, Dun & Bradstreet and E.F. Hutton have also introduced software or software and hardware combinations that give computers access to stock reports and other financial data. But these are designed primarily for individuals (using standard communications devices) rather than financial in-

dustry professionals.

Said Rittereiser, "Account executives have been engulfed by the information explosion. Where once they handled only two types of accounts-stocks and bonds-they now offer over 100 types, including IRAs and money market accounts." Merrill Lynch wants to be sure its account executives can continue to be "complete financial advisers" to their clients, Rittereiser said.

Interference (continued)

RS-232 cable, the printer, the printer cable-in brief all channels into the system unit. No improvement. In despair, we abandoned ComputerLand and called IBM Customer Relations in Boca Raton ourselves.

Interestingly, it was Art at IBM who first suggested trying an alternate keyboard, interesting, because when I did in fact acquire a Key Tronic 5150 keyboard and the problem utterly vanished, he denied ever having made the suggestion-much

would support a trade-back with ComputerLand. Subsequent conversations with Art and another IBM em-

ployee have led nowhere. Their attitude is: If you want to purchase another keyboard, fine. Our product is FCC-approved. Police stations, fire stations, schools, broadcasting facilities,

and anyone who lives near a street is subject to RFI that will crash a PC if it is not equipped with a Key Tronic keyboard. Yet IBM sticks its head in the sand. My local ComputerLand dealer says he was told by Boca that fessing up to this problem would be tantamount to endorsing a competitor's product.

Imagine the consequences of not fessing up

The technical engineer for Key Tronic in Spokane told me he'd had at least half a dozen similar complaints, all solved less having implied that IBM by a Key Tronic 5150. He had me write Key Tronic management about the situation so they could begin to include in their advertising the fact that the 5150 is RFI-proof.

If you're like me, I know you'll find IBM's stance absolutely incredible. So will your readership. Prospective buyers should be forewarned that

should a radio frequency environment arise near their PC. they are out of business thanks to the keyboard. Given the noncooperative attitude of IBM, those currently experiencing the problem (which is extremely difficult to trace, especially without the active and continuous cooperation of the offending radio station) should be told

what is happening. They should also be told that FCC-approved amateur radio stations are in no way legally liable; they are not only FCCapproved but specifically licensed to operate at up to 1,000 watts. Incidentally, the PC keyboard itself emits spurious RF that totally blanks out the 21-28 megacycle band of amateur radio-an infraction for which the PC user is responsible!

Sincerely, Travis Charbeneau Williamsburg, Virginia

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Others Dip Into Intel Chips

The 8088 is licensed again, but 80186 and 80286 production is no match for engine control chips at microprocessor factory

BY KAREN COOK

NEW YORK—Intel is letting its chips fall—very carefully. The Santa Clara, California-based company recently announced licensing agreements that, for the first time, allow computer makers to second-source the Intel 8088 micropecessor, the soul of the PC-

In addition to Commodore (see "Commodore adds Hyperion Chips," PC, Volume 3-Number 8, page 52), 8088 man-dacturers will include IBM and Sanyo Electric Co. of Japan. The new agreement will make it possible for IBM to triple PC production in 1984 (see "IBM Raplidfires PCs;" page 33).

In addition to the 8088. IBM

obtained licenses for "similar type chips," according to Intel spokesperson Stewart Sando. Neither Intel nor IBM will comment on what those chips might be, but expert speculation has ranged from the 80286 microprocessor expected to drive the anticipated IBM "Popcorn" multitasking PC, to a rather mundane series of support chips that form part of the 8088 sysrem.

Sanyo's licensing agreement will ensure that it will have ade-

quate supplies to make a big drive into the PC-compatible marketplace. In Japan, the chips were reportedly so scarce that one manufacturer attempted to bribe Intel to increase its alloca-

Intel's decision to loosen its grip on the chip that made it famous comes partly in response to complaints that there simply were not enough 8088 chips available to meet the dethips available to meet the de-

mand.

In addition, "Intel would like
to free up production for the
more advanced chips—the
80186 and 80236, for example.
There are better margins and
more profits on those products,"
says Ket Somenclaz, program
director at Stamford, Connecticut's Gartner Group, "Supplies
of the 8038 are tight, but they
pale in comparison with the
shortage of 80186s," Sonenclar
adds.

The 80186, now used in the Mindset PC, the Tandy TRS-80 Model 2000, and other compuers, is faster and more fully integrated, but still compatible with the 8088

Why is the 8088, in production for 4 years, still in such

short supply? The answer seems to be that there's a lot of competition on the assembly line.

According to Sonenclar, only 40 percent of Intel's total chip production, and almost exclusively the 8088, soes for personal computers. Intel's 16-bit 8086 is much more versatile. Sando of Intel happily reels off a list of 8086 applications: 80 percent of Japanese desktop computers are 8086 based, for example, and Ford Motor Company uses 2 million chips a year in its electronic engine controllers. In addition, the 8086 chips are used in the numerical control machines and robots for automated, flexible manufacturing, for high-end terminals, word processors, and medical

instrumentation.
"The 8086 has been available for 4 years (both from Intel and second-source suppliers), but demand is continuing to grow.
Our production increased by a factor of 3 from 1982 to 1983, and it's likely to increase nearly that much again this year,"

New deals or no, Intel's processors are still raking in the chips.

A Cathedral of Computer Art

Where but in Manhattan would a church turn into a high-tech in-sport? That's the site where over a thousand computer-graphics professionals will attend Graphix Systems 84. a day-long workshop and exhibition on Wednesday, May 21, beginning at noon. The workshops will include demonstrations of computer-aided design (CAD), animation,

and image processing. Graphix Systems 84 is being held at an appropriate site, a place where cultural traditions collide with stateof-the-art technology. It's The Limelight-a trendy entertainment complex built into what used to be the main cathedral of a landmark New York City church, located at 660 Avenue of the Americas The exhibition will conclude with a live performance involving real-time image processing and a laser light

show. Graphix Systems 84 will be hosted by the New York Siggraph, a nonprofit organization of computer artists, producers, and programmers. To register for the show, contact Richard Homerst (212) 807-8050.

How Other Languages Mind Their Millionths Several issues ago, we pointed out an arithmetic peculiarity of

Microsoft BASIC. (See "What a Difference a Millionth Can Make" in PC, Volume 3 Number 1, page 55.) When you run:

in PC, Volume 3 Number 1, page 55.) When you run: PRINT INT(2.6*7–0.2) the result isn't 18, as you might expect—Microsoft BASIC knocks it

down to 17.

Why? As we explained in "Making BASIC Mind its Millionths"
(PC, Volume 3 Number 8, page 39) conversions between decimal
and binary forms of numbers during calculations involve roundoff
errors that result in a value slightly less than 18. Then, when the 1NT
function truncates that value, the integer result is 17. (Note that the
CINT function would have rounded off the value to a proper 18.)

We tried to find how small the error was by substituting smaller for 0.2. We found that using 0.199999 gare a correct result of 18, but the result was 17 when we used 0.1999999. A mere milliomh made that much difference. From Ontario, Dr. G. J. Lastman of the University of Waterloo

sent us the results of tests he did to see how different versions of

	IRM BASIC	IBM FORTRAN	ECSO p-System FORTRAN (SYSTEM2)
INT(18.2-9.2)	18	18	17
INT(2.6*7 0-0.2)	17	£8	17
INT(2.6*7.0-0.199999)	18	18	18
INT(2.6*7 O-0,1999999)	17	18	17
			UCSO p-System
	Microsoft	1233	Pascal
	Pascal	Pascal	(SYSTEM2)
Truec(18.2-0.2)	17	18	17
Truec(2.6*7.0-0.2)	18	17	17
Trusc(2,6*7.0-0 199999)	18	18	18
Trunci? 6*7.0.0 1999999	18	17	17

FORTRAN and Pascal for the IBM PC handled four variants of this BASIC problem. This table shows his findings. Here's more proof that, even in arithmetic, computers are no more accurate than you ask them to be.

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Kaypro sales managers defect as both companies ready new computers

BY JAMES LANGDELL

ODENTON, Maryland-In nature, a chameleon blends peacefully into its background. However, Seegua Computer Corporation, maker of the Chameleon computer, stands in the foreground of several controver-

sies in the PC marketplace. On one front, in the midst of debate over standards for small diskettes, Seequa introduced a new computer based on one of the formats. And, competition between Seequa and Kaypro. another bargain-priced, dual capability clone manufacturer, has escalated because nearly half of Kaypro's regional sales managers moved to Seequa.

New Seegua 325

Seequa is the first computer maker to offer a system-the Seequa 325-with 31/4-inch disk drives, which the company says will run popular IBM-compatible programs supplied on 31/4-inch disks in the new Dysan Series Software line (See "Dysan 3.25" Disks With Hit Software" in PC, Volume 3 Number 5, page 52.)

The \$2,495 Seequa 325 is much like its earlier transportable Chameleon Plus. Both have two microprocessor chips: an 8088 that handles 16-bit MS-DOS software and a Z-80 for 8bit CP/M programs. Each computer has a 9-inch green monitor, I28K RAM, a keyboard with a PC-style layout, and two

The Seequa 325's disk drives are smaller and weigh less than the standard 51/4-inch drives on the Chameleon Plus, but only trim 3 pounds off the old machine's 28-pound bulk. Seegun is using the old chassis design in the new machine. The leftover space is now only a diskette storage slot, but it could hold another 31/4-inch drive, or a thin 51/4-inch drive or hard disk, a spokesman said.

In addition to taking up onethird the volume of regular 51/4inch drives, the 314-inch drives use one-third the power. Ultimately these drives could be designed into a more compact computer powered by batteries-a step Seequa hasn't taken. David M. Gardner, president of Seequa, said, "We don't view the Seegua 325 as a major new consumer product. We're going for a market that's interested in using smaller drives."

Differing Disks

Recent computers-most notably from Apple (Macintosh), Sony, Hewlett-Packard, and Gavilan-usee a different smaller diskette, one that's 31/2 inches in size and enclosed in a hard plastic shell. Even though this 31/2-inch style was introduced first, Gardner is confident that the 31/4-inch drives used on the Seequa 325 will become the standard for smaller IBM-compatible computers.

These drives are plug compatible with current 51/4-inch drives: they can even use the same controller cards. Gardner also claims that timing factors are identical on 51/4 and 31/4-inch drives, so software with copyprotection schemes that depended on drive characteristics need not be modified.

Sales Switch

In the marketplace, Seequa and Kaypro have staked out similar positions. Their machines are about the same size, and about equal in convenience. whether sitting on a desktop or hanging from your shoulder. They both offer dual-processor machines. Seequa emphasizes

the Chameleon's IBM compatibility, but offers its Z-80 processor as an added perk. Kaypro computers are designed around the Z-80, but with addon boards they can run 8088based software. And both Kaypro and Seegua are expected to come out with IBM-compatible

lap-sized computers this year. Even though the two companies look the same from the outside, many of Kaypro's regional sales managers seem to find significant differences.

I made no phone calls-I just took phone calls," said

Gardner, who recently hired six of the 13 regional sales managers. "That was unusual to have virtually an entire sales force approach us." Did Seequa offer better salaries? "No. but they believe they'll sell more units, and on a commission basis they'll do better here."

Gardner claims that the emigrating sales managers were uncomfortable about Kaypro's new product line. Whether Seequa and Kaypro will have more surprises for each otherand computer users-remains to be seen.

Lap-sized Compatible From Kaypro via Japan

SOLANA BEACH, Calif.-Kaypro's rise has been one of the rare non IBM-compatible success stories of the past 2 years. But, with its recent announcements, however, Kaypro Corp. has moved into the 16-bit camp. This summer it expects to deliver a lap-sized, "ultraportable" IBM-compatible computer, and now offers an optional 8088 processor for its standard 8-bit machines. Kavpro has already announced an IBM-compatible transportable system, for delivery this spring. The lap-sized machine is being developed by Mitsui, a Japanese manufacturer. This project involves Kazuhiko

(Kay) Nishi and a team that also developed the popular Radio Shack TRS-80 Model 100 and its built-in software The battery-powered Kaypro

computer will include a desktop module-a base unit with greater storage and power for whenever the computer returns home. (A similar option is now available for the Model 100.) The desktop module will include expansion slots for IBMcompatible boards. Unlike previous Kaypro machines, the "ultraportable" probably won't include 8-bit capabilities based on a Z-80 coprocessor.

Kaypro hasn't set a price for its lap machine, but it's expected to be at the "high-end" of its product line. The company plans to unveil the new model at the July NCC show in Las

Kaypro's present 8-bit computers also can join the IBMcompatible bandwagon. The Kaypro 4 is now available with the "Plus 88" option, which adds a board with an 8088 processor and additional memory. (The 8088 can't use RAM already built into the Kaypro, but the memory added on the 16-bit card is treated as a RAMdisk when the computer is in 8-bit mode.) The Kaypro 4 Plus 88 costs \$2,395-about \$400 more than the standard 8-bit model. With this option, Kaypro supplies only MS-DOS and RAMdisk software on a disk-

Currently Kaypro offers this upgrade only on its Kaypro 4. Third parties, such as SWP Inc. of Arlington, Texas, offer 8088 conversion kits for other Kaypro models, including the Kaypro II, the hard-disk Kaypro 10, and the Kaypro 484 (an improved version of the Kaypro 4) for be-

no documentation at this bar-

gain price.

tween \$500 and \$600. When it entered the computer marketplace 2 years ago, Kaypro stepped into the transportable footsteps of Osborne Computer Co .- and has stayed on a profitable trail long after that pi-

oneer lost its footing. The question this year: Can Kaypro stand toe-to-toe with IBM without getting stomped? -James Langdell

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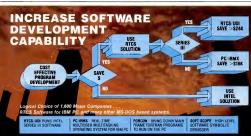
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MOUNTAIN VIEW, Calif.--With its new PC-3, Colby Computer has gone from making PCs portable to making portable

What's the difference? Originally Colby offered to take a customer's desktop IBM PC and repack its hardware into a transportable chassis with a built-in 9-inch monitor. (That's one way to assure that your computer is truly IBM-compatible: Start with a real IBM PC.) Colby also manufactured an alternative keyboard for the IBM PC. which was attached to Colby's PC-2 transportable computer. (See "Porta-Packing Your PC." PC. Volume 1 Number 9.)

The new PC-3 is a transportable PC-compatible similar in appearance to Colby's rebuilt PC-2, but the parts for this comcompany president. Someone down on the Strip (Sunset Strip) spilled to us about

Take A Byte, a computer store

puter come entirely from Colby's own shelf. Now Colby produces its own IBM-compatible motherboard that can hold as much as a megabyte of RAM. The motherboard also provides a serial port, parallel port, hard disk interface, and real-time clock. Enough space remains for add-on slots: the Colby PC-3 can handle three full size boards and one half-length board.

With its narrower keyboard, the Colby chassis is more compact than the IBM Portable PC or the Compaq. Colby's machine is 81/4 inches high, 161/2 inches wide, and 161/4 inches deen. Its width is about 5 inches less than most other transportables-inches that can make "the difference in getting it under an airline seat," says Chuck Colby,



The Colbs PC-3 is only 16.5 inches wide—trim enough to fit under an airline seat

The standard PC-3 weighs 26 pounds and is equipped with a 9-inch amber monitor, two halfheight 360K disk drives, and 128K RAM. Price: \$2,795. Colby's PC-1 and PC-2 conversions and keyboard are still

offered, and the PC-3's mother board will soon be available separately for \$799.

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in Westwood, California. We heard it was peddling software and pushing hardware far into the night. Was this on the level? We wanted an investigator to suss it out. We dropped a dime on Fred Hammler and put him on the case. Fred took the assignment with about as much joy as a batter takes a strike. But he went.

Fred's nights were slow. Every

thus he knew had turned to computer crime. The back of his skull hadn't been sapped in A messenger with green shades and an orange jumpsuit

dropped off the first scrawled report. The store was open until 10 p.m. on weeknights. But on weekends, the action didn't stop until midnight. The joint was jumping with sure buyers, browsers the owners called "lookey-loos," and users who sat down with one of the micros from the store's stable-there

were models for every taste. | The management nibbled at these users to the tune of only four bucks an hour for rent. If this was a racket, then where's

the byte? Fred tailed some of the termi- grinding out term papers. Par-

nals, but none of their menus got around to offering an option like, "Why don't you order me

some pink champagne? Take A Byte's clientele was diverse. Students from UCLA

ents who came home to find broken disk drives mingled with

pic Committee organizers ran over when their system crashed. Next day, Fred logged off the case. The joint kept funny hours, but was clean as bubble memory. Fred said he still didn't know what his pals at the wrong end of the Boulevard (Hollywood Bouleyard) saw in

Hollywood screenwriters just

off the sets. International Olym-

the silicon game. Apparently, however, there's a high-tech bug at Take A Byte, and it bit Fred hard. Today we got a hard-boiled diskette in the mail. No label, but we knew it was from Fred. We booted it up. Gunshots spit out of the PC's tiny loudspeaker. Then, after the screen cleared, it hung out this shingle. "Private shamus for hire. Packing 256K and the fastest hardware. Will follow intruders onto any lines. No escape codes. Defense Department inquiries welcome." He gave his Source number

and signed it "Deep Disk."

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Print Runs Wild For PC Primers

Shakeout question: Can publishers recoup big advances on IBM books?

BY MARTIN PORTER

The news of the spring of 1984 in the book publishing business like 1983 is that com-

puter books are hot. And if the spring listing published by industry trade magazine Publisher's Weekly is an indication, books about the IBM family of machines may well be the fastest growing category. One hundred and eleven titles dealing with various aspects of the IBM PC, the PCir. and MS/PC-DOS are scheduled to hit the shelves before summer. Some industry observers expect the total count for this machine base to hit 300 books by fall.

"We anticipate tough competition," says Joe Esposito, director of computer publishing for New American Library (NAL) which has five PC-related titles in May. "But the category is continuing to grow.

The relatively small installed base of the IBM PC, compared to mass market machines like the Commodore 64 and Texas Instrument 99/4A, has led some experts to question if there is, indeed, room for this many books about the IBM Personal Computer.

But Jody Guariglia, computer books marketing chief at Prentice Hall, maintains, "IBM books are selling. The machine is setting the standard. Our books cover the entire gamut of the subject, geared to everyone from total computer illiterates to computer scientists." Prentice Hall will be publishing 19 IBM computer titles under its four imprints this spring.

seller list that book chain B.

Dalton maintains for in-house

Bestsellers Still, IBM computer books don't often appear on the bestuse. Because of an installed hase estimated at around 2 million machines, books about Commodore computers usually hold the top slots, while even the discontinued Texas Instrument home unit has helped sell an estimated I million book titles to date. The closest thing to an IBM PC book on B. Dalton's list is Lotus 1-2-3 for Business (Oue Corporation) at number four

Nevertheless, B. Dalton marketing manager Tom Bennett is confident that there is a market for the multitude of IBM books on their way. "Those three initials are extremely important."

he explains Booksellers are also encouraged by a high book-to-machine base ratio for upseale market computer products. For example, to date 125,000 packages of Lotus 1-2-3 have been sold while an estimated 70,000 books on the topic have also traveled out the bookstore door, for a 60 percent book sale-toinstalled base ratio

Hardware Figures

Other figures encourage book editors about the IBM book marketplace, too. They point out that for every disk drive machine sold, four to seven books about it have already been bought and read. With an estimated 3 million IBM computers expected to be sold by 1985, the optimistic side would predict sales of 21 million books about the IBM PC. Even if that number were halved, computer books on this topic alone would warrant the current book title

It is clearly unprecedented," says one high level computer book publisher who asked not to be identified. "Nobody understands it. Nobody has ever seen

anything like it before." There are those book business experts who predict a computer book shakeout by next fall, a time when the six figure book advance titles will begin to show sales figures. Some of the earliest and most-celebrated book contracts last season included \$1.3 million for Stewart Brand's computer age rewrite of the Whole Earth Catalog. The largest IBM book deal was the \$800,000 advance for the PC

World Reference Library.

"By this time next year heads will roll in the publishing companies. Blood will flow on Third Avenue in New York [publisher's row]," predicts Nahum Stiskin, publisher of Microsoft Books, which are distributed by Simon & Schuster.

Stiskin is also pessimistic about whether the market can bear so many IBM PC titles. "There will be a shakeout," he adds. "The me-too product won't sell. The books that will sell are those that are good. The key to publishing is the backlist. The books that become classics are those that are good, not the first out."

Judging by the repetitiveness of this season's IBM PC titles, not everyone agrees.

There will be two books entitled How to Use the IBM PCir (Alfred Publishing, Dilithium Press) in the book racks this spring. There will be two Reference Encyclopedia for the IBM Personal Computer (Ashton-Tate Books and Prentice Hall): interestingly, both are written by the same author. Besides the title clones, there is also an IBM PCjr User's Guide (Macmillan), IBM PCir User's Handbook (Ballantine), and an IBM PCir Buyer & User Guide (Prentice Hall).

It's a Clear Case of Manual Overkill in PCjr's New Carrying Case

PCir. the company knew that it would be serving a new set of customers-home users-who



When IBM introduced the might have had no computer experience before buying a PCir. To keep these new IBM owners happy, Big Blue's documentation department seems to have put a lot of effort into writing manuals with thorough instructions for the PCir. its software. and its accessories.

IBM's documentation team went all-out when it created the manual for one product. The IBM PCir Carrying Case, priced at \$60, comes with a 14page booklet of operating in-

If you want to learn how to pack the PCjr in its case, just follow the documentation's 24 simple steps, which are amplified with six illustrations. Once boxes.

you've mastered this skill, another nine-step lesson will show how to set the carrying case's combination lock.

I hope that IBM's explanation was thorough enough so that no third-party publishers will think there's a niche for books with titles like Mastering the PCir

Carrying Case. IBM's manual ends with a warning. "You may damage your system if you use this case as a shipping container. You should keep the original packing material and use it if you need to ship your system." To be on the safe side, we're waiting

to see a copy of IBM's documentation for its PCjr cardboard - lames Langdell



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Softyme Bids for Share in Electronic Distribution

BY CONNIE WINKLER

SAN FRANCISCO—Electronic distribution of software is the latest emerging channel of distribution in the software industry. Perhaps, because of the newness—there's no consensus

newness—there's no consensus among vendors on which technique works best. Indeed, they are all still to be tested in the marketplace. Xante Corporation (a Tulsa start-up) late last year intro-

duced a scheme that requires an almost refrigerator-sized computer station at the retail location. Micro D, a successful micro products distributor, is teaming up with AT&T to transmit software, primarily for business, over AT&T's (long) comness, over AT&T's (long) coming information services network.

A new arrival at the electronic distribution party is Softyme, a joint development effort of Tymshare, Inc., which plans to deliver PC software over Tymshare's giant national packet-switched network. Software will be downloaded at high speeds (56 kilobits a second) to a PC or PC/XT in the retail store, said Robert Colten, the

former Tymshare executive now heading Softyme.

There are a couple of added twists: At the time of purchase diskettes will be serialized with the purchaser's name, and there will be a retail-focused support service that also uses Tymshare's mainframe computers.

Piracy Hook

Putting the original purchaser's name "Frank" on the diskette—readily visible when "Carl" boots the program—is "shaming people into behaving." That's Softyme's response to the software pilferage issue, Colten says.

"Eighty percent of customers' questions can be answered electronically," explains Colten about the service plan. Software customers would call their retail store, which would get the answer quickly over the network. Those toughte problems would be passed along to

support personnel at Softyme.
Softyme is being tested in four chain locations in California, Colten says. It's expected to be installed in 16 stores on the West Coast and in Chicago by

Softyme will provide the retailer with the master PC and the commanications and formatting capabilities. The system will also print out disk labels and a "mini-document" to get the user started using the program. Within 3 days the purchaser will be mailed the full manual by overnight delivery from the nearest regional Tyrnshare office. Colten says.

Service Focus

"We're putting the retailer back in control—making the store the place of support," said Colten. "That is what makes us different." He also anticipates that store-based users groups might ultimately take advantage of the Softyme network.

Softyme initially plans to handle about 70 packages for the PC, and ultimately as many as 500. There will be versions for IBM compatibles and maybe for Apple computers as well.

Softrend Emanates Integrated Aura

BY STEPHANIE STALLINGS

Softrend, Inc. is a young company from Salem, New Hampshire, which has just completed its integrated software package, Aura.

Awa's functions seem to stand well on their own. The focus of the package is its database manager, which features a select/sort function, a report function, and a menucreation facility to create a user interface.

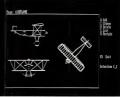
The graphics function includes the usual selection of bar and line graphs, and pic charts. In addition, it features a very handy free-form graphics facility. A mean in the upper right y, A mean in the upper right y, and the super right y, and the super right y, and the super right y, and y and

Aura has a spreadsheet and word processor that we were assured are quite respectable. The

package's fifth function is devoted to combining the other four. While editing a text, you can identify any graphs and spreadsheets that you wish to include with the text. Space is automatically set aside within the text for placement of the graphs and spreadsheets. These items are printed out within the

incrior is deing the other g a text, you graphs and you wish to lext. Space is aside within ement of the shotts. These

(603) 898-1777.



The graphics functions in the Nata integrated software package go beyond graphs and charts, it's plain to see.

'Charge It'

ple wanted to pay cash," says Victor J. Goldberge with chagrin, recalling some of the first customers at the IBM Product Centers, part of the IBM division he heads. IBM was obviously not used to selling to the public when it went retail in 1981, but the computer giant is learning.

BOCA RATON-"Some peo-

Now there's an IBM Credit Card—silver with black embossing—for use at the Product Centers and backed by the IBM Credit Corp. Anyone spending a minimum of \$300 can fill out an application, get a card, and use it immediately, said a Credit Corp. spokesman in Old Greenwich. Connecticut.

The IBM cards, like any

credit cards, have ramifications. By offering a consumer credit card, IBM Credit Corp. "could eventually get hundreds of millions of dollars in interest paymems," said Hesh Wiener, an IBM watcher in New York. He compares IBM's financing to sustomobile company plans: "The interest rates are higher than they would be for a bank loan, but you get instant credit approval."



ATRON Announces A State of the Art Advance in Software Debugging – PC Probe

PROGRAMMERS AND

MANAGERS into with the finding bugs during new product development and over the entire product life cycle adds up to a significant portion to total product development cost and support time linvesting in the right debugging tools will greatly improve time to market as well as minimize development cost. Altron Corp has the right debugging tools for the PC.

- environment These are 1) PC PROBE
- 2) SOFTWARE PROBE 3) PERFORMANCE ANALYZER

PC PROBE plugs into a PC or compatible. It is a total system debugger with features like

Real Time Trace

Program flow is saved in trace memory white running at full speed PC PROBE can display trace data as high level language line numbers, procedure names etc.— or as 8088 instructions in addition, DMA cycles, interrupil lines and external logic probes can be traced. Real time trace answers the question. How did I oet here?

Memory Protection What good is a debugger that can be

wiped out by an undebugged program? PROBE software is write protected and can I be changed

Hardware Breakpoints

The PC PROBE has 8 breakpoints and can trap conditions such as instruction execution, read, write, I/O, DMA, interrupt, or external logic probes. Breakpoints can also be set on ranges of address or data — symbolicativ too!

Enhanced Human Interface

The PC PROBE designes know the importance of EASE OF USE. The PC PROBE interface has a meru window which displays the synlax of each command — so you never have to remember how a command works it also recalls the previous invocation of each command to save tedious typing — and tedious thinking!

Symbolic Debugging Avoid the tedium of sifting through link

maps to find out where things are. The PC PROBE uses your program symbols.

Macro Commands Why be limited by a fixed set of debugging commands? PC PROBE let

bugging commands? PC PROBE lets you create your own powerful macro commands with parameter passing, nesting, LOOPING and IF/THEN/ELSE control.

ANNOUNCING SOFTWARE PROBE

The same great software used on PC PROBE is now available separately as SOFTWARE PROBE —

ONLY \$295

Software probe is the only software debugger available which provides a hardware reset and break box for program crash recovery. What good is a software debugger if ou can I get control of run.

PERFORMANCE ANALYZER How do you find time critical program

away programs?

problems or know where to start performance juring your software? Get Alron's new Software Performance and Teming Analyse? Then you can display historgrams of how your programs run—by time or by events. You can perform many different timing measurements Alron has many happy customers who have made critical product schedules because of PC PROBE Why waste time

nave made critical product schedules because of PC PROBE Why waste time on primitive debugging lechniques? — Call us today and ask for your 12-page data sheet. Manuals also avaitable for \$25





It's More Than a PC And More Than a Phone

All an executive's communications needs could be served by the Cygnet CoSystem

BY STEPHANIE STALLINGS

Dr. Federico Faggin is an elder statesman of the microcomputer field. He created the first microprocessor chip for Intel and founded Zilog, Inc. Now, Faggin and his partners, Jerry Klein and Lauren F. Yazolino, have started a new enterprise.

Their company, Cygnet Technologies, Inc., based in Sunnyvale, California, is marketing an "integrated voice and data communications system" for the IBM PC that may be in direct competition with some of AT&T's products.

The purpose of the Cygnet Communications CoSystem is to gather an executive's communications tasks under one electronic roof

The CoSystem includes hardware consisting of a telephone handset, 12-key dialer, and 28 additional buttons. The unit looks like a conventional telephone on the outside, but inside the box is a full-fledged Z-80 microprocessor chip and a modem. The CoSystem unit uses the IBM PC's sereen to interact with the user

You can use the CoSystem to send electronic mail, or, if you prefer, you can send one screen

of information at a time as part of a telephone conversation, enabling everyone involved to comment on it at once.

The CoSystem allows an extensive directory of telephone numbers to be stored in memory, and it also has automatic redial, call transfer, and call forwarding capabilities. The Communications Management System keeps a log of all telephone and electronic mail communications. If you stop to use the Co-System while doing other work on your PC, at the end of its use the CoSystem will return you to the place you left off. The Co-System also includes terminal emulation.

All of these features can be customized using the accompanying diskettes. One program lets you set up and store procedures so you can access data services, such as CompuServe, without repeating the log-in procedure.

The 300-band version of the Cygnet CoSystem is priced at \$1,495, and the 1200-band version at \$1,895. For more information contact Cygnet Technologies, Inc., 1296 Lawrence Station Rd., Sunnyvale, CA 94089, (408) 734-9946.

NEXIS Adds Time

NEW YORK-Seven of Time-Life's magazines will be available on NEXIS, the news and general information on-line database from Mead Data Central beginning in 1985.

It is appropriate for Time, "the magazine that chose the computer as the 1983 Man of the Year," to begin publishing electronically, said Larry M. Crutcher, Time Inc.'s vice president of magazines.

Editorial information from Time Inc.'s weekly publications, such as People, will be added to NEXIS within 2 days of the cover date. News from monthly publications, such as Money, will take a little longer. In order to search and retrieve

information from NEXIS, subscribers must use Mead's URIO terminal, the IBM PC, the IBM Displaywriter, or the IBM 3101 terminal

On April I, Mead will change its pricing. Instead of charging for each search unit, the search charges will be fixed, "Subscribers can afford to ask the question and receive the full answer," says Jack W. Simpson, president of Mead. A user can search the entire NEXIS database files for \$18 during peak hours and \$9 during off-peak hours, which are between 7:30 p.m. and 7:30 a.m. Searching an individual magazine, such as Fortune, will cost the user \$9 per search, \$4.50 during offpeak time

In addition to search charges, the user must pay connect-time charges (which have been dropped to \$20 per hour), telecommunications costs, and a monthly subscription charge. Mead will offer various discount rates, ranging from 4 percent to 32 percent off, to users who use NEXIS to conduct a large volume of peak-hour searches

As an added feature, Mead will provide an electronic clipping service called ECLIPSE. ECLIPSE will be particularly attractive to users who consistently track the same type of information and news. Users can track pertinent topics and trends on a daily, weekly, or monthly basis and have the ECLIPSE search results delivered automatically through dedicated high-speed printers or mailed from the company's main of-

fices in Dayton, Ohio. Weekly and daily ECLIPSE search costs are less than the normal search price. For example, making a daily search of the entire NEXIS database using ECLIPSE costs just \$216 a

Mead also supplies LEXIS, a popular computer-assisted legal research database.

Sofstar Inc.'s Business Planning Tool Turns **Worksheets into Templates**

BPT, the Business Planning grams Tool, from Sofstar Inc. BPT develops worksheets that calculate like machines, Flynn says, and forecast income, expenses, BPT's natural English comassets, liabilities, and equity. BPT can project financial trends 12 months into the future and also permits "what-if" calculations, says Ward Flynn, Sofstar's vice president for mar-

Even better, Flynn explains, completed worksheets are auto- PCs or compatibles with 128K matically formatted into tem- RAM, BPT's price: \$225.

JUNO BEACH, Florida- | plates that can be integrated into What's easier than A-B-C and more powerful Lotus 1-2-3, works with 1-2-3? The answer is VisiCalc. or Multiplan pro-

> BPT doesn't force users to act mands are easily understood by people operating in "normal human mode." Because all worksheets are formatted automatically, using BPT requires virtually no computer experi-

> Sofstar's BPT runs on IBM

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
May 10-12	SOFTWEST '84	Hardware and software for Apple and IBM PC computers.	Regency Hotel and Conference Center Denver, CO	Colorado Conference Group 3312 Cripple Creek Suite C Boulder, CO 80303 (303) 499-1034
May 15-17	Criminal Justice Systems Conference	Criminal justice applications.	Virginia Commonwealth University Richmond, VA	Virginia Department of Criminal Justice Services 805 E. Broad St. Richmond, VA 23219 (804) 786-4000
May 22-25	COMDEX/Spring	Hardware, software, and accessories for dealers and retailers.	Georgia World Congress, Atlanta Apparel Mart, and Atlanta Merchandise Mart Atlanta, GA	The Interface Group 300 First Ave. Needham, MA 02194 (800) 325-3300 (617) 449-6000
May 22-26	MICRO-EXPO	International hardware and software trade show.	Palais des Congres Paris, France	MICRO-EXPO 2344 Sixth St. Berkeley, CA 94710 (800) 848-8233 (415) 227-2346
June 12-14	Advanced Manufacturing Systems Exposition & Conference	Information systems and automated production systems.	McCormick Place Chicago, IL	AMS 84 708 Third Ave. New York, NY 10017
June 13-15	Use of Microcomputers in Occupational Safety and Health	Seminars on how to select and use micros for safety and health data collection, analysis, and retrieval.	University of Washington Seattle, WA	University of Washington Seattle, WA 98195 (206) 543-1069
June 14-17	Cincinnati Computer Showcase Expo	Hardware and software.	Cincinnati Civic Center Cincinnati, OH	The Interface Group See above
June 15-17	Computerfest '84	Exhibits, seminars, and hardware trading.	Dayton Convention Center Dayton, OH	Mid West Affiliation of Computer Clubs P.O. Box 24505 Dayton, OH 45424
June 18-21	The National Database and 4th Generation Language Symposia	Product-oriented discussions and seminars.	Stouffer's Inn of Westchester White Plains, NY	Software Institute of America 8 Windsor St. Andover, MA 01810 (617) 246-4280
June 20-22	Project Planning, Scheduling & Control Using PCs	Hands-on workshops to help upgrade productivity and effectiveness with the help of PCs.	AMA Management Center Washington, DC	American Management Association P.O. Box 319 Saranac Lake, NY 12983 (518) 891-0065
June 21-24	Boston Computer Showcase Expo	Hardware and	Hynes Auditorium Boston, MA	The Interface Group See above



If you're like most of us you probably own an IBM PC and a closetful of popular software. Maybe Wordstar, Visicalc dBase II and a few others. And with each program comes its own peculiar protocol. commands and demands

Suddenly you've become a personal slave to your personal computer. Free yourself with ProKey

ProKey is unlike any other software because it operates just about any other software. So you can spend your time creatively while ProKey takes care of the tedious operational details. Silently, instantly, without errors.

ProKey can print spreadsheet tables, update databases, reformat reports and plot graphics and still leave you time to train for the triathalon or run out for

a danish In fact, ProKey can memorize and execute anything you can type And no matter how extensive your

software collection becomes ProKey controls them all, with one easy to remember protocol With all the time you save you'll be able to customize off-the-shell software to your

own personal or business requirements. Ultimately you'll use ProKey as a 'super-command center' operating your

own software programs together to create a totally unique, incredibly creative system. ProKey is available at most Computerland stores and wherever fine

software is sold Once you use ProKey you'll never curse your cursor again.



RoseSoft Inc. 4710 University Way, N.E. Suite 601 Seattle, WA 98105 (206) 524-2350 RAM (WordStar requires 96K)

CIRCLE 436 ON READER SERVICE CARD To run ProKey, you'll need an IBM Personal Computer workship DOS (sany version, including 2.0), and 64K of

RoydStar, Vie:Colc and dBase II are trademarks, respectively, of Micro Pro, Visicorp and Ashton-Tate

PRODUCT REVIEW

Some Cracks in VisuALL's Windowing, Mouse Package

BY JAMES LANGDELL

VisuALL. Trillian Computer Corp. Box 481 Los Gatos, CA 95031

(408) 374-500I List Price: \$99.95: WordStar Shell. \$49.95 Requires: 64K RAM, one disk drive

Last year, software with windows-any windows-seemed like a great idea. And, if you made a better mouse interface (or at least something cheaper than Lisa or Visi On) the world would beat a path to your windows

VisuALL was perhaps the first piece of IBM PC window and mouse software to be delivered Trillian's product had a modest price, and it set out to do a more modest set of tasks than other interface systems. VisuALL's purpose is to save novice PC operators from having to memorize commands for PC-DOS. WordStar, and other programs. Instead, windows appear with lists of possible operations, and you can choose an action by moving the cursor onto its name and pressing a button. You can also call on help windows with on-screen explanations of programs and commands. The basic VisuAll package includes a profile for PC-DOS. Trillian provides "shells" for applications programs (so far WordStar

and 1-2-3) at additional cost. You can use a mouse with VisuALL. The cursor follows the mouse's movements, and you

Copy file

Delete file

can press buttons to select options or mark positions on the screen, say, to indicate a block of text to be moved in WordStar. VisuALL is pre-set for four mouse models: USI, Logitech, Mouse Systems, and Microsoft. The mouse, however, is optional; anything that the mouse does can also be done from the

keyboard, using the cursor and function keys. In fact, the entire VisuALL system is something a user can take or leave alone. Its windows appear only when you ask for them; they don't get in the way of using an operating system's or applications program's original keyed-in commands.

Take It or Leave It Now that I've tried VisuALL's

primary PC-DOS shell and its shell for WordStar. I can say that I'd probably leave them alone. The first set of software Trillian sent me late last year simply didn't work When I made selections from windows. Visu-ALL would make mistakes when entering the actual PC-DOS commands. For example, after I asked VisuALL to list files on drive A:, the interface software stuttered and entered "diir a:", resulting in an error mes-sage from PC-DOS.

Recently I received a cleaned up version of VisuALL (along

with a visit from VisuALL representatives). The stuttering was cured and the program worked as its makers intended. Still, at its present best, a beginner

r 'copy ' fprompt(Copy from file:) +
prompt(Copy to file:) seter

r 'cal ' ryrompt(Dates file asse:) +
mpt(fre you sure' \((y/e\)) \) +
easse(y) seter

easse(y) seter f

eass sof(y) e
easse(x) f a 'a 'a 'a 'a ' A portion of the file called on by VisuALL to prompt and execute PC-DOS operate

This "profile" can be edited to display more extensive prompts and do other tasks.

won't have an easier time learning to use PC-DOS-plus-Visu-ALL than to use PC-DOS itself. The descriptions of operations in the command windows explain little more than the names

tended to drift onto higher or lower lines. The mouse could make it easier if you had to do a repetitious editing task, say, adding control characters for underlining.

If you simply handed a firsttime PC user a box with Visu-ALL, straight off the shelf, I don't think this software aid would answer more questions than it would raise. Trillian's product does have the virtue of being easy to modify by an experienced user. The disk files with VisuALL profiles for PC-DOS, WordStar, and other programs can be edited to include a



VisuALL offers windows that his operations you can select at the press of a button. Unfortunately, it also lets you do things like display the above window of WordStar. commands while you're still in PC-DOS, which only confuses matters.

of the commands themselves. and the items in the windows are listed in a somewhat haphazard order. A new user would often have to translate between Visu-ALL prompts and the actual PC-DOS commands-effort that would be better spent learning PC-DOS in the first place.

A WordStar Mouse

VisuALL's shell for WordStar was more interesting, simply for the novelty of using a mouse with MicroPro's software. It took a steady hand on the mouse, however, to position the cursor in text because the cursor user's favorite commands and

prompts. The VisuALL manual explains how to use Trillian's set of window and mouse commands to write original profiles that suit other programs. A programmer who wants to get a taste of writing programs with windows and mice, could get his money's worth from Trillian's product by experimenting with software tools in the VisuALL environment. For the rest of us, however, these windows and mice have yet to prove them-

best friends.



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inderpayment penalties and minimum tax. In addition, Levels II and omatically compute self-employment taxes, and Level II computes

pme averaging LEXIBLE DATA ENTRY. With MICRO-TAX* you can organize data entry stiguence smilar to that of manual tax preparation, or you can ose another sequence. The use of the sequence of

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customers can now have access to an electronic mailbox and

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a impoein Tax DRCANIZER Now MICRO-TAX offers a Tax Organizer. You get both

panizer with the prior year's client data grinted on it.

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s and schedules subject is final IRS changes for 1983 tax year rated state returns excitable - Orders taken for yearly apdate puckages rencies. Level I, \$150, Levels II. III. IV. \$250 each

MICRO-TAX' MICROCOMPUTER TAXSYSTEMS, INC.

6203 Variel Avenue, Suite A. Woodland Hills, CA 91367 Dept. 1D. Phone (213) 704-7800 (Area code changes to (818), effective January 1984)

People in the News: Michael Eisenberg

Late blooming computer scientist and playwright brings the "Hackers" drama out of the basement and onto the stage

BY ROBIN RASKIN

NEW YORK—Heaker Frob. Kludge, Twiddle. Tweak No it's not a new programming language, it's the energing English jargoo, Computeresse. HACK-ERS, once confined on midnight hours and huge university computer coeters, are coming out from behind their terminals bringing their language and ideas with them. Easting their discussion of the computer coeters, and the computer sciences are the computer sciences. The computer sciences are coming out to the computer sciences and the computer sciences.

devoted nacker.

Eisenberg's off-Broadway production of Hackers (See "Play Is the Thing to Hackers Lee Drama," PC, Volume 3 Number 8, page 57) is a glimpse at the Unives of four computer science students. The play recently premiered at Manhattan's Punch Line Theatre.

"Hacking is a very compelliogactivity," says the animated young playwright. "The idea for a play about the hacker community had been brewing in my head for a long time. I admire hackers. They are brilliant people having fun."

When Eisenberg isn't sitting in Harvard Square scribbling ines for Hacker, he doubles as a second-year graduate student of computer science at the Massachusetts Institute of Technology (MIT).

ogy (MIT).

"What supecially intrigues me about computers is the reciprocal relationship between
what you chose to do and your
own personality, Naturally, peoples' personalities are reflected
in their programs—there's a certain amouto of narcissism in a
computer programmer," reflects
Eiscoberg, who during this interview was monitoring an
ongoing Hachers rehearsal.

Pre-med Bypass
At age 27, Eisenberg is a relative latecomer to the hacking community. As a chemistry major at New York's Columbia. University, Eisenberg toyed with but abundoned prepariod for medical section. He recised a Barnard College Gilbert and Sullivan Society production that inspired him to try to write a play himself—So Eisenberg and a friend wrote a successful Varisty musical, Columbia's annual song and dance show.



After graduating from Columbia, Eisenberg worked as a chemist, writing plays in his spare time. He wrote the music and lyrics for a musical loosely based oo Karel Capek's R.U.R. (Rossum's Universal Robots), the story of one ioventor's spectacular robot gone awry.

Working nine to five didn't allow enough writing time, so Biscoberg opted for the world of computers. A part-time job at Rockefeller University in New York gave him his first real, hands-en computer experience. The job required him to maintain a large program written in assembly language, giving him time to write another musical. He also fell in love—with programming.

Gaming Luck Something of a programming

addict, Mike secured a job as a programmer for Children's Computer Workshop the computer-age offspring of the Children's Television Workshop, purveyors of the Seasene Street culture. He designed a game culture. He designed a game allow the FIRS-80. The game allows the player to operate a little taxi cab and drive around "maps" of a number of different cities. Passengers apperat transform, and the player driver is required to drop them off and pick them up while avoiding traffic tickets—all io "the most efficient" manner.

Eisenberg's analysis of his own situation led him to conclude that a return to academia and total immersion in computers would keep him computing and writing to his hearts content. In what he calls a long-shot, he applied to MIT graduate school in computer science. Today he is givfully bogged down with courses like Computer Architecture and Children's Language Acquisition.

Eisenberg rest excited as the

conversation turns to his laters studies, artificial intelligence and the more "political" nature of computing power. "I like the fact that kids "do' computers well, better than adults. It's a good experience for kids to feel they are in command of something and it's good for adults to be humbled. Who knows, maybe computer kids will be more distrustful of authority, even if they are a little weird in other ways?"

In Hackers, each of the play's junk foods-consuming, belayeyed characters work releotiessly to adapt the computer to man's nature or vice versa. One character is inventiog an adventure game based on the story of his life, one is creating a computerized chess program that will costsmant the shrewdest better that will costsmant the shrewdest that will costsmant the shrewdest as speech impediment but realizes be's surrounded by something magical. And then there's Martin, Kiog of the Hackers. Hero Matio (if there is a hero) is trying to it (if there is a hero) is trying to capture his own eodearing soul in the computer's LISP machine. His ultimate dream is that he and his computer will be indistioguishable to a panel of the most scrutilizing experts. Through Martin's zany, brilliant, and incessant dialogue. Eisenberg piopoints many of the problems and prospects of articles.

cial intelligence.

Hours before he tests his "program to end all programs," Martin asks his basementdwelling fellow hacker K.J.:

Martin: "What if this program works? What if I go in there tomorrow and you can't tell the difference between me and a machine?"

K.1.: You'll have succeeded.

It means you're the greatest hacker in the world.

Martin: But a total failure as

human being. K.J.: Same thing.

Writing the play was a fusion of traditional and high technology. The first draft was written with pee and paper in Boston. Elsenberg wrote the fioal draft with MIT's EMAC'S, a powerful text editiog system, and printed it with a laser printer. He sold Hackers to the Punch Line Theatre for \$350 and receives a percotage from box office sales.

So what does he think as he watches the computing subculture becoming entertainment on stage? "I love it I think it's great that the engineeriog type has become a media personality. It's a very complicated role model."

And the fioal question, can a computer write a play like Hackers?

Offers Eisenberg with his vaguely noncommital but constantly amused tone, "I doo't think it'll happen in anything like the near future, but in principle it's not impossible".

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tractor feed.

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A Visit to the New Orleans Fête

PC's editors traveled south to charming New Orleans for the first Softcon. We found this show more pleasant than COMDEX, but the Superdome left something to be desired.

ew Orleans. There's no place quite like it—a confluence of dispartle languages, traditions, people, and buildings. The soft inflections of the residents are totally different from the usual drawl of the Deep South. Instead, their speech patterns have a stately, measured quality to them, sort of like Bostonians on barbiturates.

New Orleans has much to offer the tourist, historian, and convention goer. Its Superdome is one of the dominant features of an otherwise planar landscape, and this is where the first Softcon was held.

In the structure, which looks like a pregnant cooling tower, gathered 560 vendors and more than 20,000 visitors. Twenty thousand visitors? Less than a single day's COMDEX turnout? What kind of show was it?

It was a fine show, let me tell you. For a visiting journalist, it was a delight—room to roam, time to talk, available vendors. The wide aisles were most crowded near the Apple and Lotus booths, with IBM's area only a little less jammed. The attractions? Macintosh. Symphony. The PC Portable.

Of course, there were other attractions, including the journeyman database products such as Power-base and Salvo. And Leading Edge's new Nutshell database manager, on display for the first time, caused quite a stir.

"Macintosh Development Team" posters were everywhere. If Apple didn't have the most vendors supporting its Macintosh, we have no doubt that it was in second place.



Bill Machi

We thought we knew about every database product available for the PC, but, to our amazement, we found ten more at the show. More grist for our editorial mill. Many of the vendors we talked with

were nervous about the small crowds. Some said that the attendees they were seeing were from large companies that are already their customers. Others claimed that the leads they were getting, especially on prospective dealers, were better than those from COMDEX.

The vendors were unanimous, howev-

er, about the high quality of the attendees. Most were business professionals, a fact that was clear from their attire. One exhibitor, accustomed to attending UNIX-oriented shows, couldn't believe that tennis shoes and T-shirts were entirely absent.

Not-So-Superdome

As a place to hold a software show, the Superdome itself got mixed reviews from attendees. The main floor had wide, spacious aisles, and the stands were a welcome place to sit and review handouts, have a discussion, or simply catch your breath. The "plaza level" and loge level, on the other hand, had serious shortcomings. On the plaza level, the booths were arrayed in an unending circle around the dome, with gaps of unsold space separating clusters of exhibitors. The floor was glazed quarry tile, which, inexplicably, had been waxed, giving it about as much traction as a banana peel. Sometimes the fastest way to get to an exhibit was to go down to the main show floor, across, and up again.

The loge level was far worse. In addition to the exhibits ringing the floor, rooms full of exhibitors were tucked away in odd places. Some of these rooms bustled with active, attractive exhibits, but others were moribund

Getting to these rooms wasn't easy, either. The floors were marked with trails



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EDITOR'S SCREEN

of colored tage, and theoretically, you could follow the proper color to the room you wanted to see. The problem was, the tages as often as not meandered down wide, sweeping passages that took you back to the plaza level. These passages became a joke during the opening day of the show. Guants were posted as the entrance to the plaza level, advising everyone to take the escalation up to the loge level. There they were greeted by a bull-thorn-wideling guand who directed them to them back to the plaza level and the first seef of guants.

Tiring of this exercise, some attendees stormed the plaza level gates. The guards did their best to hold fast, but ultimately they were overwhelmed by the crush of

The Ziff-Davis booth was never dull and became a meeting place for the industry.

exhibitors and visitors who wanted to get to the booths. Not that they should have wanted to be inside: the air conditioning was trunning full tilt on a not-to-owarm day, and the public address system was rupturing everyon's exardrums. The organizers managed to get the air conditioning turned of Py mid-affentone, but the show-goorn' clation was short-lived as a public address system was the conditioning and other should be address system announcement to that effect made everyone wince and cover their cars.

One place that was never dull was the Ziff-Davis book! It became a meeting place for the industry, as a stream of software developers, entrepreneurs, authors, pundits, readers, and executives came by and stayed for conversation. That they had time to do so was swell for us, but perhaps it was not so swell for content exhibitors. Journalists abounded at the show, all

hot on the trail of the newest and best that the manufacturers had to offer. In fact, the computer journalism field has grown to the point where there is even a magazine about it, called Computer Magazine Retailing.

Bottoms Up

New Orleans is one of the few places in the country where public drunkenness is not only acceptable but commonplace. A group of us came back to our hotel one night to find a pair of show attendees, drinks in hand, swaying lightly, utterly confounded by the revolving door at the entrance.

The city has its drunken habitues, as well as its drunken visitions. Two young women from one of the public relations firms brought their jogging gear, eager for a temperate respite from the frozen tundra of their home city. As they paced off the miles, they were pursued, mostly in ine-briated initiation, by a number of the dense of the state. A quicker pace and a little kick to the stride was all it took to outdistance these tursuers.

Meanwhile, at some of the nicer restaurants, lines had formed outside. Prospective patrons held one another's place in line while they ran a door or two away to get drinks to go from the gin mills. The lines turned positively convivial at that point—kind of like an ozen-air party.

One of our editors, finally obtaining a table, was informed by his waitress, "Most of you computer people are neryous and not very nice, but I like you."

Lotus Development Corporation threw what could only be called a "Mixed Metaphor" parry: It featured a soul band in a Cajun swamp where guests were served firsh whiskey. Timothy Leary was there and, seemingly, at every other parry and open house. Perhaps he'd finally transcended any of the more annoying natural laws—the inability to be in more than one place at one time.

Meanwhile, out on the taxi line (nowhere near as bad as that at COMDEX in Las Vegas), I was regaled with New York

jokes: "How many New Yorkers does it take to change a light bulb? None of your damn business." And here I had been wondering whether the trip would be

worth it.

Back in our January 24 issue, I promiised you some articles the likes of which have never been seen in a consumer publication. One of these articles is coming up in our June 12 (Volume 3 Number 11) issue. We call it "Project: Database" and it's now into production.

We will be running a series of reviews of every database product available for the PC. Each product is assigned to one of four categories based on its capabilities. Using standard data, each category of promains as a standard set of tasks to perform. The tasks increase in difficulty from one category to the next and are related in their nature and focus. Each product also gets a comprehensive review, which covers case of use, and standard reports. Screen photos are also included.

Project Database will cover 100 or more products, reviewed by nearly 20 authors. Some of these authors' names will be familiar to you, while others will be new to the pages of this magazine. But all are expert and eager to share their findings with you.

Naturally, we wouldn't be able tool teer, you as much as we'd like about every product and put it all in one issue, so the more product and put it all in one issue, so the creviews will be spread over five on consecutive issues. The result will be the definitive report on database managed allow you to compare products guild allow you to compare products guild, while the descriptive portion of of the review will let ly ou what it's behind the wheel of each product.

Another proceeding series stready in

the works is our ongoing Price Waterhouse Report on financial and accounting software. More open-ended than Project: Database, in this series professionals from the Big 8 accounting firm give detailed, hands-on reviews of accounting packages. EVEREX for Excellence

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An Adolescent In Disguise

The microcomputer software industry is reaching a critical stage in its development but, appearances to the contrary, it still has a long way to go before reaching maturity.

In the microcomputer software business, looks can be deceiving. For example, companies like Microsoft, Digital Research, VisiCorp, Software Arts, and Lotus Development Corporation have achieved the status of giants. Take a quick look at their achievements and you might think they were part of a mature and well-established industry.

But look again. The numbers reveal how young the business really is.

The press has been understating the number of microcomputers that IBM is currently shipping. In fact, IBM is building and shipping more than 10,000 personal computers per day. It expects to self-up there million in 1984. On the other hand, Lotus has been shipping between 7,000 and 12,000 packages of 12-3 per more than 10,000 packages of 12-3 per more company is doing well, but its morth. Does this represent success? Certainly the company is doing well, but its most been successful to the size of the customer base that it is addressing not fact that 12-3 is one of the best-selling packages around.

VisiCalc is still the largest-selling program. In 1983, VisiCorp sold approximately 400,000 packages for the PC, Apple, Radio Shack, Hewleth-Packard, and CP/M markets combined. Impressive? Yes, considering the age of the program and the absolute number of copies sold. No, considering the size of the program's potential market.

If you look at the entrenched leaders of the microcomputer software industry, you can be excused for assuming that the industry is reaching maturity. But even these leaders are achieving relatively lim-



Adam Osborn

ited market penetration, and when you consider how little product and distribution innovation we've seen, the potential and the need for change comes in foot. On the control of the contr

cost up to \$30 or \$40. But the three-ring binder does not make the meager and bad-ly written manual any easier to read, nor does the fancy box make the program any easier to run. No industry can get away for long with a \$500 price tag on a product that costs \$7 to produce.

Service and support are often mentioned as justifications for the high price of microcomputer software, but this argument does not stand up to closer scriping. In the first place, most computer stores simply do not have the staff to properly support the software packages they self, nor can they afford to enlarge their staffs to provide better service. The store's profit margin is too small to accommodate free software support. It software sales are to have to charge for any support they provide. The myth that support justifies high prices is only that it as myth.

Something has to give. Dramatic changes in the microcomputer software industry are necessary and inevitable. The industry is barely off the ground, and 1984 should be a very interesting year.

and consists of a thin, badly written, badly Adam Osborne founded the Osborne founded the Osborne and a Computer Corporation, which introduced flooppy disk: approximately 57 worth of let first portable computer. His newest goods. Sick the documentation into a company, 86/bwer Seed Capital Corpotives in the object of the object of the object of the computer. His newest three-ring binder, package the whole thing ration, represents the second stage of the intercomputer revolution.

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Letters to PC

C Language for All

I am writing to register a mild complaint about some aspects of the articles on the C language in your March 20 issue (PC, Volume 3 Number 5). My complaint is essentially that they simultaneously suffer



from being too technical for the novice and too superficial for the expert. Let me give a few examples.

give a low examples. In the first article, "Getting Your C-Legs," I Estile Baker and Nat Sakowski. I make a point of allowing for different lext editions and then say that the way to compile a program is to put the program diskette in drive A and key in "BLCI manne.C", etc. They don't mention that the commands for compilation will vary from compiler to compiler. This is encellestly contissing to readers who are new to C for to compiler and manned compiler. This is encellestly contissing to readers who are new to C for to compiler allowing to readers who are new to C for to compiler allowing to readers who are new to C for to compiler allowing to those compiler and the compiler

who are used to other compilers. Similarly, Baker and Sakowski's review of version 2.0 of the Lattice compiler is not as helpful as it could be ("New Improved Lattice C"). They carefully explain the trade-offs involved in using the different memory models, but they don't joe any quantitative information as possible to the compiler of the control of the countries of the countries of the countries of the countries of the they do not describe the compiler into the compiler with the Kerton of the countries of the compiler with the Kerton of the countries of the compiler with the compiler compiler with the compiler compi nighan and Richie standard.

It is my understanding that the program in Figure 1 is acceptable, into teye clean, and that any complex compatible with the standard should handle it—even the earlier versions of the Lattice compiler, contrary to what the article suggests. Thus Baker and Sakowski raise (but don't answer) questions about the technical aspects of the compiler, and at the same time don't discuss some of the things most basic to a review.

Mark Zachmann's reviews of the Mark Williams and Whitesmiths compilers are much more helpful ("The Whitesmiths C Native Compiler" and "The MWC-86 C Compiler"). Zachmann addresses compatibility, ease of use, and performance. But why does he feel the need to write a new set of benchmark programs? At least he gives us the results for Lattice C so we can compare the newer products with a known quantity (though he doesn't say which version of Lattice he's using). It would be even more helpful if he had run a wider range of benchmarks. For example, none of his programs does much I/O. I think that it's important for PC to pro-

none of his programs does much I/O.

I think that it's important for PC to provide both introductory surveys and fairly technical product reviews. I know that it's extremely difficult for a single article to address the entire audience of PC users:

It's difficult for one article to address the entire PC audience.

perhaps most articles should pick one part of the spectrum and concentrate on serving it effectively, as long as the overall mix is reasonable.

I'm sure the transition to biweekly pub-

lication has made it much harder to keep control over every aspect of the magazine, and I expect that the high quality of PC will be uniform once again when things settle down. Meanwhile, I'm happy to be able to lift the magazine and delighted with all the page numbers.

> George Avrunin Amherst, Massachusetts

Caveat Emptor

In the March 20 issue, Barbara Krasnoff reported in a mild, almost "boys will be boys" tone that there are manufacturers

No Matter Who's Invited Some Will Term On

A few anomals ago, PC Magazine decided to give a purity. We have a sum of the pletions of newly anomalous service studies of the pletion of t

that knowingly sell comyear disciplinate pass. Which for our April 1, 1944 note
that knowye the self of the self our part of the self our passages years
ingly sell comyears of the self our passages years

puters that are not equipped

to do what those same manufacturers claim they will do. ("No Matter Who's Invited, Some Will Turn Out To Be Incompatible," PC. Volume 3 Number 5, page 57). She referred to that deplorable practice as "predictive advertising," but I think she might have used a more direct adjective—fraud, for example. Were Lamartine alive today, he might have cried, "O Semantics! Semantics! What crimes are committed in thy name!"

Krasnoff concluded with another mild comment on the fact that the buying public reacts to "predictive advertising" with nothing more than a resigned "What did you expect?"

I wonder if Krasnoff has given any thought to another facet of the computer



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LETTERS

industry that, in my judgment, is equally fraudulent—the widespread practice of selling software that the manufacturer knows full well will not perform as advertised. What are bugs, after all?

Computer software selling is a young industry, undergoing profound structural featings. The bulk of the business is concentrated in fewer and fewer hands, and the days of the kitchen table entreprencur are fading fast. Competition among the survivors will become more fierce. The attitude that the computer industry deserves some kind objectal treatment from the public is fatal. Other industries have learned that lesson.

We, the buying public, can accelerate that evolutionary process to the benefit of all by getting rid of the "what can you expect" attitude and by holding computer

Computer software selling is a young industry, enduring profound changes.

firms as accountable as we hold other companies.

Everyone who is sold defective software or hardware should immediately return the merchandise for full refund, and be fully prepared to pursue legal remedies: registering complaints with the Federal Trade Commission, the local consumer fraud agency, and the local Chamber of Commerce; charging the company with using the United States mail to defraud, where applicable; and even as a last resort, filing suit. The incidence of such outrageously arrogant behavior by computer companies would vanish virtually overnight. But if the prevailing attitude continues to be "what did you expect?", then buyers will continue to get what they deserve.

> Irving David Shapiro Oakland, California

The PC Cuts Calories

Thank you for reviewing our new program Evrydiet: A Nutrition and Diet Guide ("Programs For A Healthy Practice,"

Programs

A Healthy

Practice



PC, Volume 3 Number 4). We agree with Marilyn Schorin's assessment that entering foods can be redious. I am pleased to say that we have attacked that problem with zeall For the past month we have been shipping version 1.1, which dramatically reduces the time it takes to enter foods. Contrary to a statement in the review. Ervyride can trick special requirements for carbohydrate and cholesterd values; in fact, each user can customize the RDA values for all 24 nutrients. Thank, you for this opportunity to comment.

Joe Fargiulo Evryware Palo Alto, California

There's More for the TI As a faithful reader of your magazine, I would like to commend Winn Rosch on his insights in the review of the Texas Instruments Professional Computer ("Sizing Up The Professional," PC, Volume 3 Number 4). I am a proud owner of a TI Professional hut also a user of the IBM PC. Both machines are great, but I prefer the T1 Professional. Lunderstand that there is a tremendous lead time involved between the testing of a product and the appearance of the review in a magazine, so I would like to point out some facts that Winn Rosch left out. First of all, the memory capacity of the TI is 768K RAM, not 256K. True, the auxiliary memory board made by TI will only hold 256K; however, other boards will hold more. TI has also developed two new boards that fit in the regular slots and will increase the machine's memory to 784K.

There are at least two manufacturers of add-on beards for the Ti: Persyst Products of Irvine, California, and Quadram Corporation of Noreross, Georgia. Persyst's Time Spectrum is a multifunction board that can be expanded as the user's needs change. Quadram's board is a RAM memory expansion module. Two companies, Tallgrass Technologies of Overland Park, Kansas, and Zobes of Santee, California, offer hard-disk subsystems for the Ti. I'm still searching for others.

After raking Rosch's article over the coals, I would like to say again that I was pleased to see the TI Professional included in PC—just dig a little deeper into the tonic next time.

> Grant Nakamure Eagan, Minnesota

As a TI-PC owner I am obviously biased, but I believe that Rosch was basically fair and observant in his review of the Texas Instruments Professional computer. However, a few errors leave the wrong impres-

It is true that we will never have the broad base of software support available to IBM PC owners, but the situation is not



nearly as bleak as Rosch paints it. 1 am writing this with Wordstar version 3.3, which makes full use of the TI's cursor keys. TI owners also have TurboPascal, FORTRAN, COBOL, MS-Pascal, PL/I, Forth and other languages available.

Bob Dudley

Coraopolis, Pennsylvania

Parts of Speech

Vincent Rende's article, "Monitors: A Look Behind The Screen" (PC, Volume 3 Number 4), contained inaccurate teminology that I'd like to bring to your attention. According to Webster's, the word phosphorous is an adjective, not a noun. It is therefore correct to say, "Owing to the nature of the phosphorous compound

...", not "the visible trace depends on the characteristic of the phosphorous." The figures provided by Rende all use the correct noun, phosphor, meaning any compound that can be made to phosphoresce. CRT phosphors are typically made up of compounds of the rare earths, not the element phosphorus (please note the correct spelling of the noun).

David McManigal Stormville, New York

Community Computer John P. Jennings' wrote in "Letters to PC" that he is searching for a local government program to run on his IBM PC-XT ("Our Town." PC. Volume 3 Number 3). The Arizala Corporation has developed such a system based on 10 years of experience with municipal governments. Our software, Arizala Local Government Management Information System (ALG-MIS), is currently being used by 30 municipalities in four states. We currently offer general ledger/budgetary, accounts payable, payroll/personnel, and utility billing modules for the IBM PC and the IBM PC-XT. We would be happy to communicate directly with anyone in or out of government interested in knowing more about ALGMIS. Our address is: 210 Collingwood Ave., Ann Arbor, MI 48103, (313) 769-6270.

> Anne Nauts Ann Arbor, Michigan

The PC Goes to Church

I enjoyed reading Barbura Krassoff's artiole "The Many Faces Of dBASE II" (PC, 9). The slower response time of disk Volume 3 Number 2). The database that Tom K. Hamilton has written for is now a just barely perceptible delay churches, Church Membership and Fibeween the time a key is pressed and

nunce, sounds as if it could fill many of our church's administrative needs. I have been working to enhance the canabilities



of the church's newly purchased IBM PC and would like to learn more about what Hamilton has already done.

Jack Bitzer Louisville, Kentucky

Our church recently purchased several Kaypro computers and we are designing a dBASE II program. I would like to get in touch with Tom Hamilton, who is menttioned in Barbara Krassoff's article "The Many Faces Of dBASE II". I think the program he had selveloped and offers to churches will be worth our investigation.

> J. Stephen Spence Virginia Beach, Virginia

Tom Hamilton's program is distributed by Regency Software Marketing, 2511 Bryden Rd., Columbus, OH 43209, (614) 231-9773. If users have technical questions, Hamilton can be contacted directly care of Columbus Consulting Company, 1996 Collingwood Rd., Columbus, OH 43221, (614) 486-6043.—Ed.

A Conscious Delay

I read the article on the slowdown of MuliMate with interest because I had just received my upgrade ("MultiMate Word Processor Slows Down in New Version 3.20," PC, Voltume 3 Number 4, page 59). The slower response time of disk updates is only part of the problem. There is now a just barely perceptible delay when it appears on the screen when using a color monitor. When you're overstriking existing text, the delay increases so much that the screen is several characters behind the keyboard. Since I compose at the keyboard and watch the screen simultaneously, this stuggishness is a very real district. In my stay with version 3.11 of Mul-iMMare most of the time and use 3.20 for its result vestedless the selline dictionary.

Richard Werbin New York, New York

The people at SoftWord, MultiMate's manufacturer, are aware of this slowness and plan to release an updated, faster ver-

A Left-Handed Compliment

sion soon.-Ed.

A new PC and you didn't tell us about it? The photo on page 161 of the February 21 issue of PC (Volume 3 Number 3) clearly shows a PC-XT with the disk drives on the left, vents and speaker on the right, keyboard with number and cursor pad on the left, and monitor similarly modified.

What joy, what bliss! At last, a PC for us left handed, inverted y-axis-reading hackers. Just think of the confusing codes I could produce with this beauty. Only one problem: My local IBM Product Center and Computerland have never heard of the TX-91. How about a review?

Daniel Ehrmann Chicago, Illinois

What's wrong with the picture on page 1617—Ed.

Just One Stroke

I understand that computer usage by handicapped people is a concern of many in the computer field. I have an idea that might make computers easier for everyone to use but that might be particularly useful for those who have difficulty pressing more than one key at a time.

Peter Norton, in one of his books, refers to a less radical way than Ctrl-Alt-Del to reboot the machine. He says that typing in COMMAND at the A prompt

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LETTERS

will accomplish the same thing but without running through the hidden files of the system. I used ProKey to assign COM-MAND and ENTER to F10, and with one key stroke, I can now reboot my PC.

Ed Lucash Kent, Ohio

Thanks for your suggestion. For other examples of how handicapped people can use the computer, see: "For The Handicapped: Toggling Shift Keys" PC, Volume 3 Number 1; "Handicapped Computing," PC, Volume 2 Number 7, page 55; and "Toggling Control Keys," PC, Volume 2 Number 1, nace 74.—Ed.

PC Waters the Lawn

My business, a large wholesale flower grower occupying about 15 acres, has had a PC for a year. Our primary use for the PC is accounting and database management. Currently our irrigation system is electronically controlled by mechanical and solid state watering clocks, but I would prefer to have the PC do our watering. Our biggest stumbling block is finding the proper hardware to connect the PC to the relays that control our electric valves. I have read articles about individuals who have programmed their computers to water their lawns and turn lights on and off, and I feel my requirements would be similar. Got any ideas?

> Tim L. Myers Bradenton, Florida

Readers, any suggestions?—Ed.

Music, Sweet Music

I enjoyed the book except by Bend Enders and Bob Peterson ("The Sound Of Music," PC, Volume 3 Number 4). I found it interesting and informative, but 1 did find an error in the music-making exercise on page 186. Line 130 of the program listing should, in fact, end with "O2G+O3CD+" instead of "O2G+CD+".

Douglas R. Jackson Gainesville, Florida

PC MAGAZINE • MAY 15, 1984

Good Work

Today I received my copy of PC Magazine with the first installment from Robert Lafore's Assembly Language Primer for the IBM PC. ("Assembly Language: More Basic Than BASIC," PC. Volume 3 Number 3). Wow! We at The Waite Group feel that this is the best job we have seen of excepting a book by a magazine. and we would like to express our sincere thanks to all involved. Your editorial staff has been extremely diligent and professional, and the results show it. The quality of the graphics is exceptional, the treatment is professional, and the position of the article in the magazine is ideal. We all look forward to seeing the rest of the serialization

> Mitch Waite The Waite Group, Inc. San Rafael, California

Additional installments of Robert Lafore's Assembly Primer for the IBM PC appear in PC, Volume 3 Number 5, 7, and 9. It's always good to hear that our work is appreciated. Thanks for writing.—Ed.

Corrections:

In "Dysan 3.25" Disks With Hit Software" (PC News, Volume 3 Number 5, page 52), the first paragraph should refer to a 5.25-inch disk. Also, the size of the Dysan Flex Diskette is 3.25 inches.

Several equal signs were omitted from the two figures on page 389 of "Handling Strings with MUMPS" (PC, Volume 3 Number 6). For those readers who were understandably confused, here are the corrected figures:

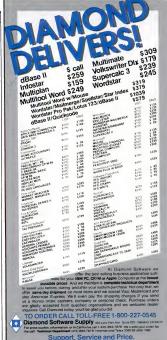
Figure 1:

VARIABLES: STR="ABCDEABCD" SUBS="CD" DI=1 D2=2.D3=3

COMMAND C=SE(STR.1)

RESULT

C=SF(STR,SUBS) C=5
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C=\$F(STR,"AB",2) C=8C=9 C=\$L(STR) C=\$L(STR,SUBS)

Figure 2: REC="Baker,D.;32;W;M;S;1/1-2/12-7/21"

COMMAND RESULT C=SL(REC,=,") C=SP(REC.",".1) C=SP(REC.",".2.5) Call Baker D." C="32,W;M,S" C-SPISPIREC,","ALT-",11 C="1/1"

The caption below the drawing on page 60 in "PC News" (PC, Volume 3 Number 6) should have been: Drawing by Levin: @ 1984 The New Yorker Magazine, Inc.

In "APL: A Language for Modern Times' (PC, Volume 3 Number 6), the APL upgrade symbol () was rendered incorrectly. It occurs four times on page 232, mistakenly preceded by the letters APL. In column 2 of the same page, 5 lines from the bottom, the words return and 'BEST' should be on separate lines; the type style of the former should be text roman. Six lines above this are the words something like followed by a blank space that should read XI & X1. In column 3, line 17 from the top, X[AV X; should read XI | AV # X:1.

In "The Sound of Music" (PC, Volume 3) Number 4), on page 184 the symbol OOI should be a treble clef sign. OO2 a bass clef sign, and OO3 a natural sign. None of these three-character symbols is used in BASIC's PLAY command.

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Sing a Song of PL/I

Norton rediscovers an old favorite, PL/I, in a new incarnation by Digital Research. This fully featured language makes his new loves. Pascal and C. look Spartan by comparison.

s many people know, I'm a programming language enthusiast. I love 'em, especially ones that satisfy my taste for structured languages, cleanliness of programming, and handy and powerful features. Whenever I've commented on programming languages for the PC, mail comes pouring in from those who feel that I've slighted Digital Research's family of languages, PL/I in particular. Today, by popular request, I sing a song of PL/L my first love in programming.

History Lesson

The history of PL/I is an interesting one. In the old days of mainframe computing, there were two basic types, commercial people who programmed in CO-BOL and scientific folks who programmed in FORTRAN, And, IBM had quite different machines to fill the two needs. Everybody knew that this separation wasn't a very good idea, so IBM created a unified group of compatible computers, the famous System 360. (Now that IBM is spinning off our beloved PC into a whole line of compatible personal computers, the industry is saying, "IBM is doing another 360.") To go with this integrated line of 360 computers, IBM wanted to create an integrated programming language that would do the work of COBOL. FORTRAN, and more. The result was

PL/I, which stands for "programming | of the closet again?) language one."

PL/I was a great idea, in many ways far ahead of its time. It wasn't until some years after PI /I's creation that the struc-



tured programming concept was developed, yet PL/I was a "structured" language from its very beginning. Unfortunately, PL/I didn't catch on too well in the mainframe world, partly because lots of deadheads really liked everything that was wrong with COBOL and FORTRAN, partly because PL/I was too complex for the average programmer to master, and partly because IBM's efforts to tell people how to program raised anti-IBM hackles. (Haven't you noticed that the success of the PC has brought lots of anti-IBMers out

Fortunately for us, the folks at Digital Research, who know a good thing when they see it, created a microversion of PL/ I. It's been available for 8-bit computers for some time and lately for our PC as

PL/I's Features

What's PL/I like? In style and format, PL/I is somewhat similar to both Pascal and C-about as similar to them as they are to each other. Anyone who has learned to read either Pascal or C will be able to easily read PL/I programs. In fact, I'd say that it's easier on the whole for a beginner to read and understand a PL/I program than programs in most other languages because its design is both clean and flexible. This clarity is a plus: you can learn PL/I quickly by studying examples, and Digital Research's compiler comes with a ton of them

What really sets PL/I apart from its competitors (which unquestionably are Pascal and C) is that it is a language rich in features. It has so many features, in fact, that it's hard to summarize them. I'll try to cover the most important ones to give you a more concrete idea of what PL/I's strengths are.

PL/I offers a great many data types, with lots of numeric formats and good support for character strings. It gives us



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NORTON CHRONICLES

more ways to work with numbers than any other PC language that I know of Soloth PC language that I know of Soloth PC language that I know of Soloth PC language bandfling is particularly good. PL/I make bot fixed- and variable-length strings. In Paccal and C, string handling is a weak on, but in PL/I, it's defined into the language. PL/I has many powerful strings. In PL/I is defined into the language. PL/I has many powerful strings functions such as SEARCH, REVERSE, and TRANISLATE. EXCHANGE features are as good as or better than those of any other language, and in my experience, programmers spend a lot of their time working with character strings.

PL/I also really shines in its input and output formatting. Many languages—especially C and Pascal—have rather weak, clumsy, and inflexible I/O features. If anything, PL/I gives us too many powerful options and features for formatting data and performing I/O functions.

data and performing I/D functions. In addition, PL/I has interrupt handling and error trapping features that neither Pascal nor C have. Among the commonly used PC languages, BASIC is the only where one to my knowledge that lets us write programs that can trap and act on errors and other special conditions. If you don't like programming in BASIC but want these features, you'll find them in PL/I.

PL/I's Components

The best way to understand PLI's strengths and features is to understand what went into creating it. When I summarized PLI's history, I mentioned that it resulted from an effort by IBM to satisfy the combined needs of commercial and scientific computer users. Actually that effort was far broader, roughly speaking, PLI was built out of four parts. FOR-TRAN's calculations, CODOL's I/O for-TRAN's calculations, CODOL's I/O for-matting, Algol's structure, and some new

The traditional FORTRAN school contributed not only handy calculation-byformula but also automatic calculation with whole arrays of data, one of the main virtues of the language APL. The COBOL camp contributed very powerful I/O formatting, particularly through an option called PICTURE; formatting using the PICTURE option allows such nice things as floating dollar signs and commas in numbers (BASIC programmers have a crude form of this feature in the PRINT USING statement). The ALGOL language (which isn't widely known these days) contributed such features as a free format for program layout, and block structuring, which helps us make sure that one part of a program doesn't interfere with another. Anyone who is familiar with Pascal and C is accustomed to these virtues; they were not only uncommon when PL/I was created, but PL/I's versions of these features are probably better than those of any language created since. The final element, which I called new topics, consisted of several abilities that had not existed before in major programming languages. These included support of interrupts (similar to BASIC's ON KEY and ON ERROR statements), use of macros and program libraries, and other goodies of that ilk.

As you can see, PLI is extraordinarily inch in useful features. It puts more power and more goodies into our hands than any other language. However, it also means that mastering PLI is a much bigger undertaking than mastering other programming languages, not because PLI is particularly hard to learn, but because there is so much to it. Its power is what's best and what's worst about PLI.

PL/I for the PC

Digital Research's version of PLI, called PLI-86, comes in both a CPIM-86 version and a DOS version, so we can use in the PC's standard DOS environment. PLI-86 is based on the popular Subset-G of PLII, a version of the language in which the grossity complicated features have been stripped off but the most useful ones retained.

My tests of DR's PL/I-86 showed that it was very nice. The compiler is nearly bug free (and I didn't find any bugs in it on my own). It compiles reasonably fast—in 2 minutes flat for a 28K source program and produces code and finished programs comparable to those in IBM and Microsoft's Pascal.

The manual that comes wth PL/I-86 is fat, thorough, and easy to understand. It's as good and as attractive to read as any I've used. On all these tests PL/I-86 scores high.

What really sets PL/I apart from its competitors is that it is a language rich in features.

PL/I-86 has one minor quirk that you ought to be aware of if you are considering it. Most DOS compilers are designed to use DOS's own linker to combine programs and library modules. That linker isn't in DR's style, however. PL/I-86 comes with its own DR-style linker and libraries, which means that we can't develop PL/I-86 programs the same way that we do in standard PC languages. While I'm not fond of that quirk, I'd rate it as a minor nuisance at worst; DR's style of linking is easy to master once you've used the DOS linker, and PL/I-86 comes complete not only with a linker but also an assembler that allows us to write assembly interface modules compatible with the PL/ I-86's linker. In addition, PL/I-86 comes with a subroutine librarian program. Hallelujah! A librarian is sorely missed in PC-DOS-when IBM wrote PC-DOS, it cheated us of the one that normally comes

with MS-DOS.

All in all, I find Digital Research's PL/
I a very good product. Now, should you use it? That depends on your perspective.

Another Language?

Although I may sound like Scrooge, I say that we already have too many pro-



NORTON CHRONICLES

gramming languages and that we'd all be better off with fewer for roughly the same reasons that we'd be better off with fewer spoken languages. I'd like the Tower of Babel to be shorter, not taller. From this perspective, PL/I is like an unwelcome extra guest at an already-crowded party. But for those who believe in lettine a

Although I may sound like Scrooge, we already have too many programming languages and we'd all be better off with fewer

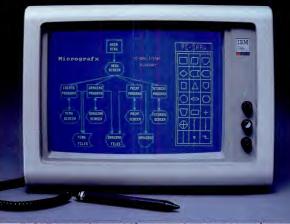
thousand flowers bloom, I say PL/I-86 is terrific. The language is wonderfully rich and powerful, and the compiler seems excellent. For its strong features alone, PL/I should be considered by anyone who wants the closest thing to the ultimate in programming.

I'm a true believer in structured programming, which I think is the most reliable way to write programs. For good structured programming, you ought to be using a well-structured language. Pascal and C quality, but PL/I adds significantly to our range of choices because it has so many programming goodies. C is a very lean and auster language with few features, and although Pascal is less suster, it still a language for feature Soartans.

If you are choosing among these three languages, start by considering Pascal, a sound, solid language with excellent safety features. If lean and mean programs what you are after and you don't mind a few extra programming errors, look north to C. If super flexibility and powerful features are what you are after, at the expense of loneer programs, look south to PUI.

of longer programs, look south to PL/I.

And if you still love BASIC, don't look
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SUPERCOMPUTER POWER & THE PC's FUTURE

We're still in the infancy of personal computing. Like it or not, our prized PCs are just powerful toys. Cray's top-of-the-line machine can perform a billion operations in a second. Engineers are using supercomputers like the Cray to cram astonishing speed and power into the next generation of chips. The price and size of these supercomputers are shrinking dramatically. You may have the power of a supercomputer at your fingertips sooner than you think.



here is considerable speculation these days concerning the next ineamation of the IBM PC. Everyone expects it to be far faster and more powerful. Most observers 80286 chip, faster RAM, and vastly improved graphics. But all this is really just a buby step. The real question is what kinds of machines we'll all be using in 5 or 10 years. And the answer is nothing short of assonibiling.

In the middle of this century, a handful of researchers needed a way to calculate the trajectories of artillery shells very quickly and sketched the plans for the first electronic computer. The handware they built used tens of thousands of radio tubes, consumed vast quantities of electricity, and took up a large room. But it did allow extremely rapid calculation and became the envy of the scientific community.

Today, even IBM's low-end PCjr can run circles around that jumble of handsoldered joints and throbbing glass diodes. But the technology that spawned the

Apple and the PC and their host of imitators is nearly a decade old. With the market for micros exploding, and technological competition proceeding apace, we may have tiny computers on our desks with awesome abilities sooner than we think.

The most powerful machines on the market—dubbed supercomputers—are being built by companies such as Cray, CDC, Fujissu, and Hitacht. While them assive devices are designed to do complex calculations at speeds that leave micros gasping, most of the engineering advances that boost supercomputer speed and power can benefit PCs as well.

Future increases in microcomputer performance will result from better chip construction and design. Supercomputers are already helping integrated circuit developers optimize the layout of beefier chips; as an example, Bell Labs' new 256K RAM could not have been created as easily without the help of its speedy Cray. As recently as 2 years ago, American manufacturers had the supercomputer field all to them-

selves. But, spurred by governmentfunded programs to wrest dominance of this field eastward, Japanese computer producers are now selling supercomputers as powerful as Cray's, and are hinting that future releases will put America's top products to shame.

This race for technological supremacy can only help PC users. Researchers at most of the top computer companies are experimenting with radical new chip designs and materials. One promising area of study centers on using gallium arsenide (GaAs) substrates rather than silicore, this has the potential of speeding up processing by a favor of the Chemosan control of the processing of the proc

Today's supercomputers can perform a billion operations per second, far more than the few hundred thousand cranked out by the PC's humble 8088. What will the desktop (or the wrist-top) of 1994 be like? Odds are that it may have much of the sneed and power of today's Crays.

IBM is not going to stand idjly by and of the PC market. It very much wants to manitatiurs red, eit of the PC market. It very much wants to maintain its position as the microcondon set meirocondon set of the period set of

The PC of the 1990s may indeed have the power of today's Cray. But what does this mean? What's so special about such fast computers? How will you use them? The following articles suggest some of the capabilities PC owners may have at their fingertips in the decade ahead.

This and the following illustrations were generated on a variety of Cray computers, and represent true state-of-the-art computer graphics.

You don't run 1-2-3 on your Cray. You use it to squeeze 100 million extra barrels of oil out of your favorite oil field or track the 2,000 threatening weather fronts all over the globe. The Cny looks vaguely like something a space voyager would see pitting from the surface of Jupiter through a swrling methan fog. Hollywood wanted to suddion it for the role of WOPR in the movie Warmon of the surface of the surface

You don't run 1-2-3 on your Crny. You use it to squeeze 100 million extra harnels out of your favorite oil field, track the 2,000 fureatening weather fronts all over the globe, crack genetic and spy codes, or coax an extra megadeath out of your best nuclear warhead. If the software were available at your local Byte Shop, it would have names like NukerCale or WarStar.



light.

MIPS, MFLOPS, and MOPS

This is a world of MIPS and MFLOPS and MOPS (millions of instructions per second, millions of floating point operations per second, and millions of arithmetic/logical operations per second). A supercomputer is loosely defined as a machine that can perform at least 20 million computations per second. The Cray X-MP, running at a machine cycle time of 9.5 nanoseconds, is capable of an overall instruction issue rate of more than 200 MIPS and computation rates of over four hundred 64-bit MFLOPS and 1 billion MOPS. That's fast. Even if you don't know anything about computers, it sounds fast. And supercomputer progenitor Seymour Cray has plans for new models that will put even these to shame.

So do several single-minded teams of Japanese scientists. There's a storm brewing over the tepid American efforts to keep pace with racing Tokyo technology. Growing numbers of vocal computer Cassandras in this country warn that global leadership in technology is swinging eastward. What makes these predictions especially chilling is that computers are becoming increasingly enmeshed in most phases of daily life. While the international battle for the next computing technology is currently focused on supercomputers, the advances gained in this area will no doubt spiral down into the burgeoning population of conventional mainframes. minis, and micros, and even cars and appliances.

Cray Research currently manufactures four products built around two central processors, the Cray-L/M and the Cray-Z. MP. A futuristic new system, the Cray-Z, is expected to be in production in late 1984. Eighty percent of all the supercomputers in the world are Crays; two-fifths of these are used "to support some type of energy research at U.S. Department of Energy National Laboratories and similar

facilities in Germany, France, and the United Kingdom," as Cray gingerly phrases it. The energy they for researching is the kind favored by Dr. Strangelove. Two-thirds of all Cray sales are to foreign customers. Governments are the prime buyers, accounting for half of all purchases. The rest are split fairly evenly between universities and businesses.

In 1982, the company announced its Crav-1/M (the M stands for Metal oxide silicon memory). It worked about the same as Cray's older supercomputers, but because of its MOS circuitry, was half the size and price. The 1/M now goes for about as much as the typical top-of-theline IBM mainframe, and Cray salesmen are eager to convince corporate MIS executives to replace their less powerful machines with entry-level supercomputers like this one. According to Cray CEO John Rollwagen, this should "open up the market" for the Cray X-MP (which stands for experimental, extraordinary multiprocessor), introduced 2 years ago, which sells for the same \$10 million to \$14 million as the original Crav-1 but has up to five times the computing power and a raft of nifty extras you just don't get with your PC. Rollwagen admits that the real profits lie with the X-MP and the even newer Cray-2, a Tom Swiftian machine 3 years and \$20 million in the making with a dozen times the power of the Crav-1.

One Supercomputer to Go

You can take a supercomputer home for as little as 54 million, but the newer models carry a hefty \$14-million price tag. And remember, you also have to own a pretty beefly mainframe or supermini that you can plug your Cray into. Still. If you want to trade your Cray in for next year's model, you won't have to toos your experiences with programs. Sepromor Cray ensures that all his never machines are software-commented with the comment of the service of the comment of

Is a Cray just an astonishingly soupedup version of a PC? Well, yes and no. On one hand, they're both a collection of CPU and 1/O chins. A decade from now.

according to one Cray researcher, the estimated and the control of the control of the control billion annually. Chip speeds and abilities are continually climbing skyward, while prices plummet. Replacement chips that boost performance and typically cost 20 to 30 percent less than their outstated versions are announced each year. And engineers estimate that chip describes and the resulting power and speed can increase by resulting the control of the mental insits of technology the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the speed of the control of the control of the control of the control of the speed of the control of the control of the control of the control of the speed of the control of the control of the control of the control of the speed of the control of the control of the control of the control of the speed of the control of the control of the control of the control of the speed of the control of t

Twenty years ago, the gut inside integrated circuits were approximately 25 microns wide. Today, the same components are commonly 3 microns wide, and manufacturers are adopting 1.5 micron technology. The industry has moved in his period from analy-scale to large-scale integration, where circuits contain from 1,000 to 100,000 devices. These days, in certain forward-leaning industries, very-large-scale integration (VLSI)—packing

barrier than we realize.

You can take a supercomputer home for as little as \$4 million, but the newest models carry a hefty \$14-million

price tag.

up to 10 million devices on a chip—is standard. In 20 more years, ultra-largescale integration, with far more than 10 million components per chip, will be the rule. Motorola technological strategist J. Jeffrey La Vell prediets that by the beginning of the next decade the figure may be as high as 20 million per chip, compared with the half-million on your average 256K RAM chip today.

Chip developers have compared the process of engineering a typical chip to "designing, mapping, and monitoring the highway system for metropolitan Los Angeles in an area 1/20 the size of a postage stamp." Cray Research scientist Kelly Wild explains: "After mapping all the streets and highways onto that small area, one would have to keep track of where each street led. All possible routes to any given location in the micro city would have to be tracked. In addition, the length of time required to arrive at any location taking any possible route would have to be known. One would be required to monitor all traffic lights in the system and note which ones were red, yellow, or green at a given point in time. Information about which streets had high or low volume traffic. in which direction, and at what times of day would have to be available upon request."

A two-transistor, five-part circuit cost 50 io 1906 and 10 cents in 1978. Wild quotes some engineers as predicting that Let Vell's 1990-vintage chip will sell for one-tenth of a cent. Supercomputers will be both the beneficiaries of this leap in technology and part of its cause. Chip designs have become so complex that it may soon take a supercomputer to puzzle them out efficiently. If this is true, velo-tem out efficiently. If this is true, well-them out efficiently. If this is true called the control of the c

The 256K dynamic RAM that many say will be the memory mainstay for the rest of the decade has already benefited from the power and speed of the super-computer. Bell Labs used a Cray-I/S extensively in developing its 256K VSLI chip. Circuit simulations that normally

took 4.4 CPU hours on Bell Labs' Honeywell HIS 6080 were dashed off in 20 minutes on its Cray. Crays typically outperform the superminis commonly used for such circuit analysis by a factor of 100 or more.

The Cray X-MP

Cray's X-MP., the best American technology you can buy today, resembles a sort of squat, space-age Stonehenge. Twelve vertical columns form a 270-degree are. In each column are twin chasses containing as many as 72 chip-crammed modules. The power and coding hardware nestle around the Cray's many control of the control o

The X-MP boasts a pair of identical CPUs, each more powerful than the single CPU in the Cray-I (which itself is no slouch). These two central processors are carefully synchronized through clusters of

So much thermal energy boils off the Cray-2 that its engineers decided to dunk the whole unit permanently in a tank of pure liquid fluorocarbon.

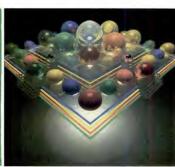
shared registers in the CPU intercommunication section and through the central memory.

The X-MP is designed to book into Cry's Solid-State Storage Device (SSD), which gives users as much as a quarter gjadyby of on-line storage. This is like having a RAMdisk that can salt away that a contained an I,600 single-sided floppies. The unit weighs in at a cool ton and a flift, takes up 10 square feet of floor space, and needs an internal refrigerator to space, and needs an internal refrigerator to recommend to the space of the space of

The CPUs are built around 16-gate array circuits, which help give the K-MP its 9-5-anosecond clock cycle time (compared with 12.5 anoseconds on the 1/S) and 38-anosecond memory bank cycle mile. Its four parallel memory access ports and lickery-split CPU yield eight times the cold susble memory bandwidth of the Cray-1. Competitive supercomputers have red hot spees too, especially some form Japan. But take a second to stop drooling and see exactly what this means.

Cray benchmark expert Mike Escyalins. "The problem is not the maximum theoretical numbers of bandwidth or MOP rates, but what percentage of those maximum numbers you can get to the war. Fujitsu, Haschi, and NEC are all boasting higher MOP rates, but those numbers don't mean anything if the user can't get at them. It's a question of software and application. Some applications just can't run at those speech. Some can't be executed. Some calculations involve several III reasts before you'ver do a mulsure of the control of the several III reasts before you'ver do a multer of the control of the c

The new Cray-2 CPU will measure a compact 2 feet by 3 feet, one-tenth the size of the Cray-1 CPU. No wire will be longer than 16 inches, compared to 4 feet in earlier Cray versions. In a vacuum, light tray-tels 1 foot per nanosecond. Electrons



coursing down a wire move at about a fifth of that rate. Much of the delay in high-speed computing is in shuttling data back and forth over miles of wires. Each supporting chip module will be eight layers thick to further reduce the length of connecting wires.

But wedging chips next to each other to reduce the signal travel time produces a fierce buildup of heat, especially when the components are packed as densely as they are in the newer Crays. Older models whooshed Freen of trustyle cooling channels to dissipate the heat, but so much thermal energy boils off the Crays CPU that its engineers finally decided to drunk the whole unit permanently in a tank of pure liquid flaorocarbon, a clear fluid with the consistency of saids oil.

The original plans called for a 32-million-word memory and a CPU cycle time of 4 nanoseconds. Operation will be dramatically enhanced through multiprocessing—the Cray-2 will contain four separate central processors that will serve to carve

complex tasks down to size.

In the Trenches

A supercomputer is quicker than a Pc for many reason. The clock is faster—the X-MP is ready to do something new every 2.5 shillouths of a second, and the Cray-2 will be three times speeder than that. Since the PC clock ticks once every 210 billionths of a second, it is 16 to 50 times slower right out of the block. In addition, the PC can shuttle only 8 bits of information from chip to chip at a time, which the Cray moves data over a 64-bit bus. There's another factor of eight.

The Cray has specialized hardware units within its CPU to handle various mathematical functions especially quickly. There are special declicated circuits for vector and scalar addition, subtraction, shifting, logic handling, and multiplication, floating point addition, multiplication, and reciprocation, address addition, subtraction, and reciprocation, address addition, subtraction, and multiplication to the programment of the

almost none of these time-saving mechanisms, and usually ends up huffing and puffing its way through repetitive calculations to perform functions the Cray dis-

patches in a pass or two. The Cray also boasts such speeddemon features as a pipelined CPU and interleaved memory. What this means is that special hardware queues up data to that new processing can be started virtually every time the clock ticks, while a large amount of other processing is still in progress. Its CPU can be starting a compution while it's a quarter of the way through a second calculation, halfung the computer of the way through a second calculation, halfung the computer of the way through the computer of the way through one of the way through the computer of the way through the way

The Cray is also specially built to store and move vast buckets of data words at a time. But beyond all this, the Cray can handle true parallel processing and vector processing, which leaves the humble 8088 buried in its dust.

Vector Magic

Computers can crunch two kinds of variables, scalars and vectors. A scalar is a single number-one constant in a formula or one element in an array. A vector is simply a series of numbers that can be operated on in similar ways. If, for instance, you wanted to increase the salary of every employee in a company by 10 percent, you could perform either scalar or vector operations. A scalar operation would find the first personnel record, calculate the additional salary, write the increased figure to a part of memory, loop back and get the second record, figure out the increase, write the new figure to memory, loop back for the third, and so on, until it exhausted the raw data.

until it exhausted the raw data. A vector operation would load in all the salaries and zap the values all up by 1.1 virtually at once, without having to backtrack for each new record. One vector instruction would read in all the raw figures, the next instruction would perform all the multiplications, and the last would

store all the new figures in the appropriate place.

However, while many programs can benefit from vector processing (such as those with lots of loops, matrixes, and arrays), many cannot. An IF-THEN can choke a vector processor momentarily in its tracks, so any computer with vector processing architecture must be able to handle scalar operations as well.

Early vector processors had other problems. It could list a long time by computer standards to set up the vector processing operation, which meant that long loops paid off in time savings but not shorter ones. If the vector was too short, the vector operation "start-up" time combined with the actual computation time ended up taking longer than it would have to perform scalar operations on the individual elements. And since the vector processor ory and try to slap back the new data virtually simultaneously, there was often an anonying memory logiam.

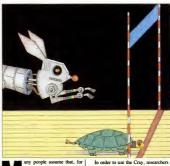
Sophisticated supercomputers like the sophisticated separate registers and instructions for vectors and scalars. The start-up time for vector operations is so brief that vector processing pays off in time savings with as few as two elements. Special instructions juggle vector registers to avoid memory conflicts.

The memory isself is composed of banks of fast, power-hungry, bipolar chips. It has special circuitry to correct all single-bit errors and detect all double-bit errors. With a Cray, you don't have to worry that in the middle of an important by you'll look up in shock and see the bane of PC users—a frozen screen and a "Pastiv I" error.

Instruction buffers in the Cay are unusually massive, allowing large chunks of instructions to be stored in one gulp. If an instruction branches forward or back and, its destination is often already loaded in the buffer and can be immediately executed. The PC buffers only four instructions. And because the Cny X-MP can handle such large words, when it has

THE TORTOISE AND THE HARE

The Cray may be the fastest computer around, but after waiting all day for a few seconds of CPU time, you may long for a PC.



any people assume that, for the pumpose of scientific and quity, the Cup is the best way to go. The Cup, with it accessed through a frustent mini or mainframe computer, can run through highly complex calculations very quickly. (In fact, the Cup is no sophisticated that the U.S. government problishing that soft of members to Cupmuniar countries.) But, because of its regulation for super data ophistication. Crays are popular, and therefore, expensives to use and difficult to access In order to use the Cray, researchers must (unless they are extraordinarly rich) rent time through a time-sharing service. The cost depends on how much of the machine's memory is used, how much 1/O is required, and how quickly the computations are needed. Users must be patient since they may have to wait most of a day for their turn.

Until recently, it was assumed that the Cray was so much faster than any other machine that, even considering the lag time, it was still the best and fastest electronic resource for large number-crunch-

BASIC ' MacIntyre works with the center for Atmospheric Chemistry at the university's Graduate School of Oceanography. Currently, MacIntyre's sea-bubble studies are funded by a grant from the National Science Foundation (NSF), which hopes that such research will contribute to an understanding of the global cycles of many natural elements-as well as artificial pollutants-that are continuously released by the ocean into

the atmosphere. He got the idea of comparing his PC's performance to that of a Cray when he started running a light-scattering program originally devised for use on the Cray, MacIntyre translated the program, written in FORTRAN by Warren Wiscombe at the National Center for Atmospheric Research in Boulder, Colorado, into MMSFORTH when he found he needed it for his work.

"It measures the light scattering from particles not much larger than the wavelength of light," he explained. "So you can't do it just with geometric optics. You have to use full electromagnetic equations. This program gives you two components of the polarization and the intensity of the function of angle clear across the spectrum.

"For example, there must be 15 or 20 different kinds of halos that appear around the moon. Because the particles that scatter the light are all different sizes, you have to integrate not only across the wavelength of light but also across the range of droplet sizes or ice crystal sizes. In my case," he said, referring to his work with ocean bubbles, "that means that each different sized bubble gives me different results.

"The thing about light-scattering programs," he continued, "is that they consume a lot of computer time. So what Wiscombe did was to sit down and try to speed up the original program as much as he could-and he did it to a factor of two over the next best program."

Typical Hardware

MacIntyre uses a fairly typical hardware system: an IBM PC with 128K, two single-sided 195K disk drives, monochrome and color monitors, a printer, and a Hewlett-Packard 7478 plotter. In order to speed up operation, he added an 8087 math conrocessor chip. Coupled with MMSFORTH, a high performance, stack-oriented computer language, it transforms his PC into a viable scientific computer.

"The secret of speed using the 8087 chip is to keep all the intermediate values on its little stack. It's 80 bits wide, so it

Sophisticated supercomputers like the Cray have separate registers and instructions for vectors and scalars

takes you ten fetches and stores to move things to it. But if you keep intermediate results on the 8087 stack, then you avoid the overhead of sending 10 bits out to memory."

Once MacIntyre had translated the program into MMSFORTH, he began to wonder about its speed as compared to a Cray, "My feeling is that the PC is about 1,000 times slower than the Cray. Twenty of that is just in clock speed, since the clock on the Cray is 20 times faster than the clock on the IBM. Then there's word length-the Cray is 64 bits instead of 8, so you can do more in a single instruction on the Cray than you can on the PC."

He is planning to try a real test of the PC against the Cray sometime in the future. "Sooner or later, all these programs hit a numerical instability, and things just go to pieces. When my PC program hit an instability as the bubbles got larger. Warren Wiscombe assured me that this happens to everyone on all machines, sooner or later.

"In fact, Wiscombe has said he'd be glad to compare notes with me on the machines' performances. He would run his program on the Cray, and I would run mine on the PC, using the same input numbers. Then we would compare and see when each one begins to go bad."

Meanwhile, McIntyre is happy running his figures through MMSFORTH on his souped-up PC. "I've talked to the scientific and technical subsection of the IBM subsection of the New England Computer Society, and they are struggling with Fortran-and I mean struggling. I figure I'm 3 to 5 years ahead of them in what I can do with my machine.

"As far as I know," MacIntyre concluded, "this is the most complicated program that has been run on a micro "

-Todd Katz and Barbara Krasnoff

to jump to a new instruction it can haul in 8 memory bytes per clock tick.

The process of the control of the co

The Cray can scorch your I/O lines with eight occurrent data streams to as many as 64 tape units (half of which can be churning away at any one time) as well as to forty-eight 600-megabyte disk drives. The drives can shovel bits back and forth over wo 100-megabyte-per-second channels, and one high-speed conduit is capable of hurting a billion and a quarter bytes per second in and out the door to the Cray solid state memory.

CHIPpewa Falls Makes Good Today's supercomputer is the brain-

child of its eposymous founder, Seymour R. Cray, an occentrie's eccentie's Child of Chippeus Falls, Wiccossin (Annie Half) hometown. Cray, if you believe the public relations puffery, helpod invent superior the public relations puffery, helpod invent superior computers and single-handedly deeped most of the early ones, first as a cofusued or Control Data Cooporation (CDC) and later as his own favorite designer. One anational business magazine recently la-beled him "a national resource," albeit an unusual one

Cray has garnered much attention for his quirky habit of designing sleek sailboats. He'd lay down the plans and build a new one by hand every year. He'd sail it all all summer, and then—are you ready burn the thing in the fall. This would spur him on to devise an especially yar craft the following season. "There's not much to designing." Crus is ford of spains."



design computers about the same way I design sailboats—for simplicity."

Cray left CDC to start his own company in 1972. A swarm of trusting venture capitalists anted up \$2.5 million in seed money. Cray bunkered down in an abandoned shoe factory to plan the construction of a "super-quiet think tank where we will develop a colossal giant computer." The offices were designed to be as acoustically dead as possible to eliminate distriction and encourage soliture creativity.

The company's singular mission was to develop what Cry called the "next generation of supercomputers." He carefully contributed development efforts, since giving in to the temptation to create mainframes designed for a mass market would force his flediging company to go elbowto-flow with such industry giants as BIM, NCR, Control Data, and Sperin Instead, Cray insisted on carving out his own small but growing niche.

following season. "There's not much to designing," Cray is fond of saying. "I bevelopment was parsed out to small teams of engineers, each responsible for

specific tasks and safely removed from the drudgery of daily company management. Cray saked his developers for major performance leaps that would change the aname of computing. "The person using significant." he said. "I contribute to it's significant." he said. "I contribute to the providing a tool. If I were just building something a little cheaper and a little more cost-effective. I wouldn't get the satisfaction I do out of doing something more dramatic."

One of the problems in building such a sophisticated machine is that the number of potential buyers is small. Cray initially identified fewer than 100 whose simulation and modeling needs warranted the expense of buying the machine. The sophisticated requirements of these potencray's computer had to contain a million words of 50-annosecond memory. The year clock had to mat 12.5 nanoseconds. The entire unit was eventually housed in a box 6 feet high and 4 feet in diameter, knitted together with 60 miles of wires.

As the first Cray-1 neared completion in 1975, the 58 of million Cray Research had mixed since its inception was nearly gone. Cray dispatched chief financial officer John Rollwagen to New York to raise 510 million more with a new stock offering. While the company had never sold a single unit or generated a cent of revenue, eager investors snapped up every share. The following year Cray delivered his first working system to Los Alamos National Center for Atmospheric Research as its next usabone.

A Better Mousetrap

At this point, the production goal was one system per year. Cray began development of the next generation supercomputer in 1977 and upped the annual production to four, and then to eight in 1978. At the same time, he expanded the compan's production of applications software that would run under his proprietary COS (Cray Operating System).

In 1979, Cray Research announced the Cray-1/S, a version with more mensor in Cray-1/S, a version with more meny and cenhanced I/O capability. The compand cenhanced I/O capability. The compand cenhanced I/O capability. The compand of the Cray-1/S compand to compand the condition of the 4 years capability to over 500. Its profit that year equalled the total capitalization of the 4 years founding. Cray resisted the temptation to produce less powerful hardware for all produce less powerful hardware for all the companion of the comp

on the New York Stock Exchange for the first time. By 1981, 35 systems had been installed, and there were over a thousand employees on the payroll. Cray released the X-MP spees, and announced the Cray-2, an awesome hunk of hardware 6 to 12 times as powerful as its predecessor and half its physical size—a machine that pushes silicon to its technological wall. In the first 7 years of business, Cray's

In 1980, Cray Research shares traded

company sold a total of 60 machines. Various government agencies walked away with half of these, the tests were divised with half of these, the tests were divised to the second process of the second process. According to recent reports, its entire universe of potential customers amounts to 50 active prospects, although our of five times that number of universities and industries are catching the fever and thinking about taking the plange. White the company is not exactly rolling and thinking about taking the plange. White the company is not exactly rolling reported that in 1952. Cary Research range up a \$19 million net on \$141 million of sales, and estimated 1983 sales at \$170.

million.

Seymour Cray has passed the reins of the company he founded to John Rollwagen and is now under contract as a consultant. His main interest these days is developing a new generation of computer chips with gallium arsenide (GaAs) substrates rather than conventional silicon. Electronics engineers are wringing the last bits of performance out of silicon—there is a the-

There is much emphasis at Cray Research on style, and little of the rockribbed stuffiness that characterizes some large computer producers.



PC MAGAZINE • MAY 15, 1984

oretical limit to how tiny you can make the traces and devices on a chip. But by putting these devices on gallium arsenide compounds in the same densities, you can kick up nerformance by a factor of five.

There is much emphasis at Cray Research on style, and little of the rockribbed stuffiness that characterizes some large computer producers. This attitude can be attributed in part to the free-wheeling image of the company's founder. Rollwagen sums it up this way: "We take what we do very seriously, but don't take ourselves very seriously. Economy comes from high value, not low cost. Aesthetics are part of quality. The Cray approach is informal and non-bureaucratic. Verbal communication is the key, not memos, 'Call, don't write' is the watchword, People have fun working at Cray Research. There is laughing in the halls. With informality, however, there is also a sense of confidence. Cray people feel they are on the winning side. It is this sense of confidence that generates the attitude of 'go ahead and try it, we'll make it work."

Cray Best Sellers

Cray's catalog of applications software doesn't boast any spreadsheets or games. But you can pick up a helpful package if you plan to noold around with a simulation of launch and upending characteristics of launch and upending characteristics of large offshore structures, static, value terms, reactor transfers analysis, nodes are terms, reactor transfers analysis, nodes are structure simulation. MOS transistor design, eigenvalues and eigenfunctions; or the cray and transfers and significant control. Cray also offers a text processor called ROFF.

Crays are immensely popular with oil companies. Locating new oilfields involves processing hundreds of millions of faces, such as complex data from seismic studies and evaluations of satellite photographs. And once a promising field is located, there are many ways to extract the oil. Mathematical models can tell an engineer which extraction technique will maximum or many can be considered with maximum of the construction technique will maximum or many can be considered to the construction of the const

imize recovery over time. The stakes are so high and oil companies so wealthy that they want the most powerful computers on the market, hang the expense. Arco's Cray-1 paid for itself in one simulation by squeezing an extra 7 percent out of a 20billion-burnel oil field

Mersenne Primes

Crays are also frequently used for pure mathematics calculations. The 27th, 28th, and 29th Mersenne prime numbers were discovered on a Cray, using a complex formula chockablock with Greek letters and odd signs that is not included here as it would give the typesetter apoplexy. A Mersenne prime is an integer of the form 2°P-1 where P is a prime number. The first few are 3 5 7 13 17 and 19 and were nailed down by Father Marin Mersenne in 1644. Why, no one knows. Their singular property seems useful only in testing computational ability and getting press attention. Mathematics luminaries Fermat and Euler were obsessed with this arcane area. So was someone at Black Rock: When the

The 27th, 28th, and 29th Mersenne prime numbers were discovered on a Cray, using a complex formula chockablock with Greek letters and odd signs.

25th Mersenne prime was discovered, Walter Cronkite announced it on the CBS Evening News.

By 1963, various computer operators had listed the first 23 of these. In 1979, Cray employee David Slowinski, "with hopes of being mentioned in Time magazine," set out to unearth the world's largest prime number on a Cray-1 undergoing a factory checkout, which could handle the necessary 75 million 48-bit-precision integer load-multiply-shift-adds per second without batting an eyelash. Slowinski was using his own implementation of an algorithm called the Lucas-Lehmer test. A similar computer run to locate 2°8191-1 took 100 hours on Illiac-I (in the ancient history days of 1959), 5.2 hours on an IBM 7090, 49 minutes on Illiac-II. 3.17 minutes on an IBM 360/91, and 10 seconds on the Cray.

Slowinski verified the 26th Mersenne prime just 2 weeks after it had been announced by rival searcher Curt Noll. It had taken Noll 8 hours and 40 minutes on a CDC CYBER-174 supercomputer (designed by -who else?-Seymour Cray). Slowinski's search on the Cray took less than 7 minutes. But the Eberhart conjecture predicted that the search for the 27th would take 2,000 hours of Cray time (an expensive proposition even at the 1979 rate of \$7,500 per hour.) Undaunted, Slowinski was able to incorporate a number of shortcuts into his search and stumbled onto the number after testing a mere thousand unwieldy integers.

sand unvitely ringegs. 24497 - 1, is a 13.35-sqip whopper, not is small potance and in its Sign probler. Merenine control in Sign probler. Merenine too, after a miling 600-boar hant. Sign winds was in on the new discovers which was well, having streamlined the search algorithm by 40 percent over its slow-firm by 40 percent of the search algorithm by 40 percent over its slow-firm by 40 percent over its slow-firm by 40 percent over its slow-firm by 40 percent of the search algorithm by 40 percent over its slow-firm by 40 percent over its slow-firm by 40 percent of the search algorithm by 40 percent over its slow-firm by 4



comparing the relative price of two cans of tomato soun.

Slowinski thinks he has found the 29th. It is a 39,751-digit behemoth (2°132049 -1) so unwieldy it is taking a long time just to verify.

Others have found more practical applications for their Crays.

Computers for Art's Sake

Booing estimated that a computationaly derived improvement in the aerodynamic efficiency of a 747 jet would result in annual fuel savings of \$75,000 per aircraft. Experts peg the potential improvement in efficiency on aircraft designed on top computers rather than through conventional engineering techniques at 10 to 20 percent. To handle the intricate aerodymanic equations required for this kind of saving, half a million expensed points on the 3-D representation. Beeing erotics is Cray with the feat of increasing the aerodynamic efficiency of part of its new 167 ownamic efficiency of part of its new 167

| jet by an astonishing 12 percent.

Digital Productions is a Hollywoodbased film and production studio "devotbed to the advancement of state-of-the-art computer graphics imaging and animation." The goal at Digital Productions is to produce computer graphics that audiences can't distinguish from live action scenes. Digital owns a Cray-1/S and was the first company to order a Cray. Art.

The 1/S can calculate the needed million polygons per 4,000 × 6,000 pixel frame. The rule of thumb is that animation requires ten calculations per pixel per frames per second, vii will take 5.76 billion calculations to produce 1 second of firm but since compiles animation can require as many as 1,000 calculations per pixel, vii can take over half a trillion arithmetic interval of the control of the control to the control of the control of the changes each frame of the film, and many pixel calculating operations can be performed with relative case. The company's undernated graphics medicing system. Digital Seene Simulation, takes into account such factors in every frame as perspective, highlighting, shadowing, surface texture, microfactoring, reflection, the effect of multiple light sources, volumetric transparency, translust cores, and refraction. And these articles for stationary objects. To simulate true realism, a companier must juggle the realism, a companier must juggle the stationary objects. To simulate true realism, a companier must juggle the stationary objects. To simulate true for the stationary objects, and the other physical effects of nation of the other physical effects of nation of the other physical effects of nations.

For instance, we don't really see things, the way they are. The focus of our vision is extremely tight. If you look at a book on a shelf across the room, you may notice that you can focus on one word of its title at a time. The other words in the tilt look fairly crisp and sharp, but this is an illusion. If you really concentrate on keeping your focus fixed in one place, you'll see that surrounding books are not really in very sharp focus and that things at the edge of the room are actually just blurs. They

don't appear blurred because your eye can dart to any other object in the room affocus on it in a fraction of a second, and because we're accustomed to seeing things blurred—our minds know what a lamp looks like and translate the blurred image at the periphery of our perception into a sharp, crisp image in our brain.

Similarly, if you move your hand back and forth in front of your face, what you'll really see is a flesh-colored smear with the wall behind it pecking through. This phenomenon plagues computer graphics designers, since it's hard enough to create the image of a hand moving or of a natural-looking room. Observers can usually spot computer animations because they're too good. The moving hand looks too strangely perfect; the whole room looks too sharp and crisp. We use depth of field cues to orient ourselves; if we're looking intently at the back wall, something right before our eyes can't also be in focus and vice versa. A good computer animation has to constantly monitor what object on the screen should be receiving our attention and then progressively cover the other elements in front and back of it with layers of visual gauze.

This is such a laborious process that on Digital Productions' original Cray 1/S, at the quarter-million polygon complexity level, a total of 4 minutes of film was generated each month. The total annual production of 45 minutes of animation was expected to increase 400 percent with the arrival of the X-MP.

One outside graphics arists who moved from a less powerful system to a Cydiscovered (much to his dismay) an additional feature of supercomputers—super-curacy. When the artist ran his program on the Cray after running it on the smith grogram or computer, he was astonished at the drawing speech to the fiduled by certain for time in gaped has the faddled by certain for the result of the Cray's penchant for Cray's penchant for her best of the first has been developed had rounded off has been developed had rounded off the first had been developed had rounded off the Cray and the crow was multiplied.

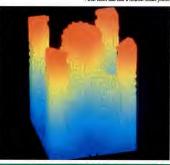
While no micro can touch the performance of a supercomputer, some enterprising technicians have successfully networked micros together into a primitive parallel processor.

the reiterative looping common in most programs.

National Laboratories

In 1978, Lawrence Livermore National Laboratory installed a Cray-1. I now has a total of six Crays systems, Scientists there have calculated that one of their Cray-1 computers has 22,200 times the power of the lab's original Univa I. The Crays are used both for classified weapons research and for such normilitary applications as analytic cytology and the development of controlled fusion reactors.

Los Alamos National Laboratory owns five Crays linded together in one massive system. Its engineers actually built one of the very printilive supercomputers, MA-MIAC (the Mathematical Analyzer, Numerical Integrator, and Computer) in 1952. Its successor, the University of Pennsylvania's fabied ENIAC (Electronic Numerical Integrator and Calculator) was a monstrous concatenation of 18,000 electron tubes and half a million solder ioints.



Los Alamos later purchased innovative IBM systems such as the 701 and STRETCH, and eventually turned to two systems Seymour Cray designed while working for Control Data Corporation, the CDC 6600 and 7600.

Today, more Crays are installed under one roof at Los Alamos than at any other facility, and four older CDC machines designed by Seymour Cray are there as well. Seventy percent of all the Los Alamos computing programs are for "national security" projects. The laboratory owns several printers had can chum out 10,000 lines per minute. Five thousand networked users produce up to 3 million pages of more fire synchron five years and the property of the property o

The laboratory was the site of a telephone-line break-in by the notorious Milwaukee 414s late in 1983. The teenaged intruders managed to tap into one of the small VAX computers in the unclassified partition of the three-partition network. Officials were not amused and sicked the FBI on them.

Cray vs. Micros

One Cray analyst, spurred by the request of his son's teacher to address the class on computers, compared the performance of a Cray-1 S/2400 to that of a TR-S-80 in multiplying a 50 × 50 matrix. The TR-S-80 submibled through the calculation in 3,180 seconds, while the Cray poped it of if no 202 of a second. However, his son's TR-S-80 cost \$5999 and the particular Cray model a herly \$7.000 cost, and \$1.250,000 while the calculation in 3 of the second side of the se

While the TRS-80 computer was not built to do matrix multiplication, the Cray analyst dryly observed that to have equivalent price/performance ratios, either the Cray-1/S should cost 200 times more than it does or the TRS-80 should cost 200 times less.

HARDWARE	SOFTWARE	TIME (in seconds	
Crav	FORTRAN	:00.001	
VAX 11/780	FORTRAN	:03	
HP 9000	FORTRAN	:08	
Apollo	FORTRAN	:59	
Symbolics	FORTRAN	1:23	
Sun	FORTRAN	1:30	
BIT LSI-11/23	FORTRAN	2:00	
IBM PC	QNX C (with 8087)	1:15	
IBM PC	Supersoft FORTRAN (with 8087)	5:10	
IBM PC	Supersoft FORTRAN		
	(no 8087)	8:20	
IBM PC	C 86	28:12	
IBM PC	Lattice C	29:12	
IBM PC	IBM/Microsoft		
	FORTRAN	224:00	

Figure 1: The results of a study done by Lawrence Livermore Laboratories comparing speeds of a range of computers.

Cray vs. the IBM PC

Cray benchmark expert Mike Ess is often asked, "If everyone in the United States had an IBM PC, would we still need supercomputers like the Cray?" The answer is an obvious ves. The PC is just too small to solve large problems such as oil field simulations or space shuttle reentry turbulence models. And it is painfully slow. How slow? Ess points to a study done by Lawrence Livermore National Laboratory (see Figure 1). All the machines in the study ran the same program on a hydrodynamic mesh code called JELLO, with a mesh size of 5 for 1,000 iterations and with codes as similar to each other as possible. Timings were crude and the longer PC runs were timed with a stopwatch rather than by the software.

While Ess is pleased that the Cray is so fast, he cautions us not to attach too much value to the results: "Conclusions about machines shouldn't be based upon one application, on one program, and one set of data." With this in mind, he adds that

he can't resist extrapolating that 1 Cray second is equal to .87 days of IBM PC time with the best software or 155.5 days of IBM PC time with the worst software!

While no micro can touch the performance of a fire-breathing supercomputer, some enterprising technicians have successfully networked micros together into a primitive parallel processor. A Japanese attendee at a recent Siggraph convention claims to have networked 64 micros together to yield performance close to that of the top dedicated graphics worksta-

Semiconductor Advances

Semiconductor Advances
Cray is working with a subsidiary of
the Harris Corporation on a joint project
involving supercomputer chips made of
gallium arsenide. Cray's Rollvagen admits that the days of strictly silicon-based
supercomputers are numbered. "The
speed limitations of silicon are now being
reached. The trend there is for greater den-

sities without significant changes in speed. Consequently, newer technologies, like gallium arsenide, are being explored. GaAs seems to be the technology of the future as far as speed goes, but it will be coupled with other technologies as well, such as CMOS."

Dr. Richard Soshea, a vice-president of Harris, agnes: "GaAs integrated circuits can operate at speeds up to five times those of silicon-based equivalents. This advantage is being increasingly recognized in the design of microwave and high-speed signal processing systems. GaAs technology is now sufficiently well-established no courage its application in very low speed computer systems like Cray produets."

Some scientists at Cray Research say that gallium arsenide will be to computing in the 1980s what silicon was to the industry in the late 1950s and early 1960s. Gallium arsenide beats silicon hands down in several key areas. According to Cray senior design engineer Phil Gerskovich. the most important considerations in choosing materials for integrated circuits are electron mobility and insulation. "The electron mobility of GaAs is about four to five times faster than that of silicon. Not only that, but these electrons can be moved at high speeds and at lower voltages than silicon. That factor is very important in designing supercomputers that demand tremendous amounts of energy." And gallium arsenide's insulating properties are desirable since no special insulating designs are required (as they are with silicon) and since switching time is faster.

Chips of the Future

Gallium anenide does have problems. A GaAs wafer now sells for around \$300, compared to \$6 for silicon. But researchers point out that much of the final chip cost is tied up in processing rather than raw materials. GaAs is also fairly brittle, but special precautions can compensate for this. There are a host of other nagging issues. Jons, when accelerated, can tear

THE ORIGIN OF PCS (AND THE DESCENT OF CRAY)

The Cray and the PC are silicon cousins in the same evolutionary line. They may also share a future.



t first glance, the PC and the Cray, desktop magician and supercomputer sorcerer, have little in common. In fact, though, the little fellow and the mighty Cray share a common future.

Both machines are the offspring of the ancient giants that were handbuilt in university basements and military garages during the early years of computing. Clattering, house-sized behemoths stuffed with vacuum tubes, these prototypes were far bigger than today's Cray while less powerful than the PC. From them flowed two streams of computer development, each culminating in the PC and Cray, respectively, and each in its own fashion pointing the way to computing's future.

The technological current that led to the Cray emphasized the values of speed and power. At the headwaters of this current were the ENIAC and UNIVAC—in their time, the most powerful computing machines in the world. During the 1950s and succeeding decades, the best minds in computing struggled to make machines that were even faster and more powerful, even more awesome in overall capabilities than their mighty predecessors. This lineage led to successive generations of mainframe computers, then supercomputers, culminating in the incredibly potent Crays, which seem in a position to dominate computing's highend for the next generation.

The PC path began at the same source but headed in a different direction. ENIAC and UNIVAC, though computer dinosaurs, were also the most convenient and practical computers of their time. The realm of microcomputing was discovered as successive waves of computer designers attempted to create machines that could do at least as much as-and, it was hoped, much more than-the vintage 1945-1951 models in more convenient ways, in easier-to-use shapes, and with friendlier systems and more-flexible hardware. The result of this stream of innovation and personalization is the PC, a human-size machine that balances power and convenience.

Computer Evolution

The PC and Cray are clear illustrations of how in the world of technology, as in biology, different environments can produce great variations in the descendants of one family. But there is one great difference between technological evolution and its biological counterpart; namely, in technology, disparate relatives are not separated for all time. They can evolve toward one another and converge, as is the case with the PC and its cousin, the Cray.

In a very real sense, when you look at today's Cray supercomputer, you are looking at the capabilities of the PC of 2019. The computing power of the old ENIAC now fits on a chip half the size of a contact lens. In a new generation, PCs will be chip size and the machine that sits on your desk will easily do what only a monster supercomputer can accomplish right now. "One good way to assess future trends is to compare a current supermini with what might be available in the size of a PC in 10 years," says Michael Ess of Cray. "One excellent supermini can now be bought for about \$500,000 with a million words (8 gigabytes) in storage and a 64-bit word length. In 10 years, that machine will fit

onto a chip." Ten years beyond that, in the year 2004, a current mainframe could easily shrink to chip size. In the even more distant future, Michael Ess describes "a very good and likely scenario" in which incredibly powerful PCs-with capabilities far beyond those of today's mainframes-work in tandem with supercomputers in computer networks of such blinding speed and capacity that nothing done today can truly describe them.

Von Neumann's Bottleneck

At the supercomputer end of the scale, development will not be as fast as with desktop PCs. At current speeds, supercomputers are beginning to bump up against the limitations imposed by the laws of physics. Since their signals can move no faster than the speed of light, their components must get closer and closer together and their switches faster and faster to speed them up. Supercomputers have already become so swift that

improve their speed. In addition, supercomputers must overcome a theoretical barrier-the von Neumann bottleneck. Mathematician John von Neumann established most of the rules by which modem computers operate. One of those rules decreed that only one operation can happen in a computer at any one instant. Operations can follow incredibly quickly one after another, but they can't gang up. Future supercomputers are going to have to ignore von Neumann's ideas and create entirely new methods of processing data in huge, simultaneous chunks. Cravs already do this to some extent, but in order to speed up new supercomputers, designers will have to abandon von Neumann and his computer ground

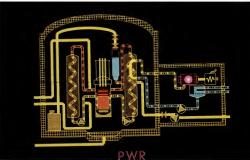
only esoteric designs and switches based

on peculiarities in physics can possibly

All this means that small computers are well on their way to catching up with their more powerful supercomputer relatives. The two branches of the computer's genealogy, having diverged from a common past, are converging toward a common future. That is the principal reason why the Cray can be a subject of fascinating speculation for PC owners today.-Richard Basil

Richard Basil is a corporate consultant in the fields of marketing and communications. He is also a published author and freelance writer.

The PC and Crav are clear illustrations of how, in the world of technology, as in biology, different environments can produce great variations in the descendants of one family.



into the chip and damage the underlying wafer. Silicon chips are easier to repair. But Cray engineers—and many engineers in Japan—feel GaAs will indeed be the semiconductor of choice in the decade ahead.

Future chips must not only be faster but must work under more demanding temperature conditions and under a wider range of voltages. A promising area of research in this direction is with strainedlayer superlattices (SLS), a new class of material made up of alternating layers of crystals grown so thin that 5,000 strata barely equal the thickness of a sheet of ordinary paper.

SLS semiconductors are exceptionally flexible, since each layer can be grown independently of its neighbor. Contemporary chip performance is degraded by imperfections between adjacent layers. But careful control over the elastic strain of each SLS layer during crystal growth results in a far more perfect atomic alignment than is possible with any of the conment than is possible with any of the con-

ventional techniques.

Sandia National Laboratories, a leader in SLS materials, is growing these new crystals via molecular beam epitaxy (MBE) and metal organic chemical vapor deposition (MOCVD), two precesses not commonly used in traditional chip manifacture. The only SLS devices that have been produced to date are simple diodes, but, according to Sandia researcher John Gall, strained-layer superlatives appear to be a major advance in semiconductor device science.

Other new techniques are promising revolutionary increases in the special and Pozibility of chip fabrication. Lawrence Livermore National Laboratory is now using what it calls "laser pantography," to paint circuits directly on blank semiconductor wafers. Green laser light a billion times more intense than noontime sunlight is pulsed through clouds of gas onto target a single microin in diameter. This process is fast and reversible. Laser pantography are produced to the process in fast and reversible. Laser pantography can produce the time it takes to fabrication and the production of the production

ricate a new chip from weeks to hours, a real boon for experimenters.

Japanese Inroads

Histahi and Fujitsu have announced supercomputers that rival the X-MF supercomputers that rival the X-MF supercomputers that rival the X-MF supercomputers and the recently superior. In many respects, clining the sage generation of Japaneses machines. Yet superior is many respects, clining the sage of programming and the high degree of computability with existing American business computers. The Times were left-entirely ended the monopoly in high-performance computing held by the United States since the dawn of the computer en."

In 1982, the Japanese Ministry of International Trade and Industry Jaunched an ambitious program called the National Superspeed Computer Project with the express goal of producing, by the end of this decade, a supercomputer a hundred to a thousand times more powerful than the current crop of supercomputers. Another government-sonosed program, the National Fifth Generation Computer Project,

States computer manufacturers formed the Microelectronics and Computer Technology Corporation to thwart the transfer of computer primacy eastward. And 13 United States chip manufacturers pooled resources to start The Semiconductor Research Corporation, which they hope will "assure long-term survival in the market," according to director Larry Sumney (read "long-term American survival"). The Pentagon's Defense Advanced Research Projects Agency (DAR-PA) is now working on plans for its supercomputer-level "Strategic Computing and Survivability" project, but it has targeted this research toward the creation of smarter weaponry. Congress has committed a paltry \$20 million annually for peacetime studies.

Fujitsu and Hitachi projected deliveries to approximately 30 domestic customers in the first 18 months. more new customers than Cray Research expects worldwide.

Nobel Criticism

Many American scientists criticize such domestic programs as utterly unsubstantial. Dr. Kenneth G. Wilson, Cornell University Nobel laureate, sees grave consequences in the Japanese invasion: "They're clearly thinking about the IBM market. If the Japanese have really achieved IBM compatibility and can manufacture large numbers of these machines. they will compete seriously with IBM. with serious results for the United States."

Dr. Wilson is an ardent critic of the federal government's lack of support in this area, "The Administration's financial support figure is absurdly small, so it's really up to Congress to set a realistic figure. We need whole new families of supercomputers. The outcome will affect the entire United States industrial base. The issue hanging in the balance right now is whether American computer manufacturers are going to meet that need or leave it up to someone else."

Few American researchers have had a chance to use these new Japanese supercomputers, but those who have speak glowingly about them. Dr. Steven A. Orszag, a scientist at the Massachusetts Institute of Technology, had nothing but praise for what is shaping up as the most impressive new entry, the Fujitsu VP-200: "Fuiitsu has taken the best features of Crav. CDC, and IBM architectures and put them all together. What is revolutionary is that these fast Japanese machines could be used by business or government. In the past, the uses of supercomputers have been much more specialized and mainly scientific."

In fact, Orszag feels the Japanese supercomputers surpass their American cousins in two important areas. The first surprise is that the VP-200 can use standard off-the-shelf software rather than expensive applications packages custom written for particular machines and needs. Even more astonishing to him, however, is that the VP-200 seems to be softwarecompatible with IBM.

Orszag derives two messages from this: "First, the machines are accessible to people who don't know much about computers. Second, the programs are portable and can be moved from computer to computer. That's important because software development today represents up to 90 percent of the cost of using a supercomputer. The Japanese advances will bring down costs dramatically. One doesn't care so much about small differences in speed; what's important is ease of use. We didn't realize until a very short time ago what an effort the Japanese had made on this point."

Congress Talks

In 1983, the U.S. House of Representatives held hearings to investigate the current and future state of computing in this country and abroad. In the hearing charter, the government worried out loud that "Japanese industry and government have designed two cooperative research and development programs that are intended to result in a 100-fold improvement in largescale computer performance" and that they threatened to "dominate the international markets for mainframe computers within 20 years."

In his testimony before the subcommittee, Cray's executive vice president John Carlson raised the spectre of Japanese domination of the market: "The world is on the verge of a major computing revolution as supercomputing is applied across a broad industrial and scientific base. The only question at this juncture concerns which nations will choose to lead this revolution.

"Many have questioned why the Japanese would enter supercomputing since their normal strategy is to target industries with broad commercial significance. While it is possible that the venture into supercomputing has been more for prestige. I believe that history will record the venture as a shrewd one. When Fuiitsu and Hitachi announced their supercomputers last year, they projected deliveries to approximately 30 domestic customers in the first 18 months, or more new custom-

ers than Cray Research expects worldwide during the same period.

"The importance of leadership in supercomputing technology goes far boyond already well-established links to defense and national security. Leadership in supercomputing technologies, and in the aggressive implementation of that technology, could play a significant role in the future of both our basic industries and new technology frontiers.

"The record of the last five years indicates that in environments other than the Department of Energy laboratories, the U.S. research and engineering community has been slow to implement supercomputing technology. Even the defense and aerospace communities, which have in the past aggressively applied new computers, have lagged seriously behind their countermarts overeas."

Robert Cooper, director of DARPA, sees someone else in the woodpile and is on the record as wanting faster and more intelligent supercomputers to "hold off the Soviet threat." DARPA spends well over half a billion dollars annually on projects to develop "intelligent" weaponry systems.

Echoing Cooper's concern is Dr. Roder L McCroys, director of the University of Rochester's Laboratory for Laser Energies, who reminds the scientific community. "Until now no one challenged us, Supercomputers are strategically important. We've always had an edge over the Soviet Union in this regard." What bothers many experts is that a superior Japonese product could mean not only the loss of an important matter for American for a more product could mean not only foreign manufacturers for high-speed computers and components critical to national security.

If you want proof of this last point, look at a partial list of Cray clients: Lawrence Livermore, Sandia, and Los Alamos National Laboratories; the U.S. Air Force Weapons Laboratory; the Magnetic Fusion Laboratory; NASA; the UK Royal Armament Development and Research

We've reached the point at which true advances in circuit design will be proposed, tested, and verified by computers themselves.

Establishment; Lockheed Missiles & Space Co.; as well as similar institutions in France, Sweden, and West Germany. The master roster of users also includes several listed simply as "Classified."

The PC Connection

While supercomputers aren't directly influencing the way PC owners process text or chart the profits of their company, technological advances will benefit all computer users. The effects of faster, cheaper, smaller semiconductors and supercomputers ripple quickly downward.

Years ago it was laughable to think they so many people would have the power of a room-stand computer on their desktops, yet advances in chip design and factionation have made this commorphise. As financial and nationalistic pressures driven increasing urgency, and prod worldwide competition, we may soon see affordable hardware that packs a far bigger wallop than anyone can imagine today.

Spurred by government efforts to keep the cutting edge of computer technology on these shores, this nation's scientific community may yet hammer together a tiny, astonishingly fast and powerful computer with enough intelligence to appeal to agrestic yahoos who today wouldn't even

be able to figure out how to plug in a PC. But don't count your chickens yet.

Cray Chairman John Rollwagen, speaking at a recent conference on the frontiers of supercomputing held at Los Alamos National Laboratory, said he felt true intelligent computers would not be feasible for several decades: "Today's computers are left-brain machines. A right-brain oriented computer is far bevond where we are today. Using supercomputers is much harder than making them. There is always a time lag between the introduction of new high-powered hardware and the development of software that takes advantage of it." This is where the Japanese are said to be the weakest, and where many say they will falter.

Others disagree, and compare these complacent industrialists and politicians to battleships bobbing in the unsuspecting waters of Pearl Harbor. Supercomputers are becoming increasingly critical in our economy; they're already the mainstays of the armament, meteorology, oil and mineral exploration, cryptoanalysis, and aircraft worlds. They're rapidly chiseling out footholds in the automobile and shipbuilding industries, and in such research areas as genetics and medicine. And one of their most promising uses is in designing circuits for better, faster, more powerful computers. True advances in circuit design will be proposed, tested, and verified by computers themselves. The nation whose computers are better able to refine chip design will end up with better computers that will in turn be able to refine chips better, in a tightening loop-or noose.

The Cray X-MP is just another compare.

The Cray X-MP is just another compare.

The While he idea of having the special ord versatility of a Cray X-MP on your desktop seems ludicious today, who knows what will happen in 5 or 10 years? The PC is far faster and more powerful than some large computers a decade old. What's secting is that the race for performes is heating up fiercely. Whether the next stating performance advance comes from Wisconsin, Minneapolis, Armonk, or Tokroy, we'll all be the beneficiaries.

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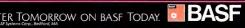
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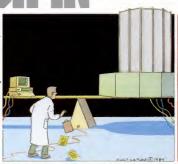


COVER STORY . MICHAEL J. HANNAH

A Delicate Balance:

PG&THE SUPERCOMPUTER WEIGH IN

A comparison of the tiny PC and the Cray-1 supercomputer may seem absurd, but the two are more alike than you might think. Many scientists, in fact, use this mighty machine duo as a team.





ere you sit, the most avid user of your company's Cray-1-that state-of-the-art supercomputer installed in its special environmentally controlled room. And on your desk sits your new IBM Personal Computer, complete with an 8087 mathematics conrocessor chip. Your hoss has asked you to evaluate the PC as a tool to support the scientific work you now perform exclusively on the Cray-1. Isn't that like comparing a wind-up car with a souped-up Porsche? Maybe not. Scientists and engineers throughout the nation are doing just that and finding the Cray-1 and the PC more alike than they expected. Like the Cray, the PC can be programmed in the scientific language FORTRAN; for some applications it might even be the better choice. And many laboratories are hooking the Cray and the PC together to form on unbestable team

I work at the Department of Energy's Sandia National Laboratory in Abusequeque, New Mexico as its Cray-I and IBM PC consultant. May job is to help reaches scientists and engineers find out what a PC consultant. When the impact of most possible consultant is a simple consultant of the process of the proces

Until recently, the computational needs of the scientific community were met with the biggest and fastest computer that electronic technology could produce. The Cray-1 supercomputer, manufactured by Cray Research, Inc., is capable of performing up to 80 million floating-point operations per second, with up to 32 million bytes of addressable memory. Nonetheless, major national scientific laboratories agree that the Cray-1 is neither fast nor large enough for their projected scientific computational needs. With the increasing need for power and speed, what role can the PC possibly play in the shadow of this computing giant?

A Factor of 1,000

The PC can be described as a "milli-Cray," In discussing the two, the factor of 1.000 recurs frequently. The list price of a Cray-1 is about 1,000 times that of a fully configured PC (roughly \$6,000,000 versus \$6,000). The Cray-1 performs many standardized benchmark tests approximately 1,000 times faster than a PC. And the Crav-1 requires about 1,000 times more space than the PC. However, the factor of 1,000 does not always apply; you don't need 1,000 PCs to do the work of one Cray-1. Nor do these figures represent a sufficiently detailed comparison with which to understand the potential uses of each machine for scientific computing.

The hardware differences between the Cray-I and the PC are not as great as you might expect. Naturally, the gulf in storage capacity is wide. The PC's available internal storage depends upon how much RAM has been added, but will typically range from 320K to 640K bytes. Assuming you have carefully abided by the 64K boundary limits for subroutines and "common blocks" required by the current compilers, all of this memory except that used by the operating system is available to the FORTRAN programmer. The Cray-I has 4 million words, each 8 bytes wide. or 32 million available bytes, from which you must subtract those used by the operating system. Many significant Crav-1 programs make use of an overlay loading feature of its operating system that is not currently available on a PC. It allows multiple subroutines to all use the same memory area for their code, so long as certain noninterference rules in their calling structures are observed. When needed, each subroutine is loaded from disk and overlays the common reserved memory area. Using this feature, carefully structured code that is ten times its physical memory size is often run on the Cray-1. Thus these supercomputer programs are often 500 to 1.000 times as large as those that could fit on a PC.

The PC and the Cray seem more similar when you compare the hardware that

DELICATE BALANCE

performs the actual computational work (see Figure 1). To perform serious floating-point calculations on the PC you must use the 8087 mathematics coprocessor. and the numbers should be stored and computed as FORTRAN double-precision variables that are stored as what Intel calls "long reals," or long real numbers. These "long reals" make 64 bits available, which in scientific notation is split between an effective 53-bit mantissa and an 11-bit exponent. The 8087 does internal computation with an 80-bit temporary real-number storage that consists of a 64bit mantissa and a 15-bit exponent, plus a bit to show the sign. On the Crav-1, standard floating-point numbers are stored in 64 bits, but are split between a 48-bit mantissa and a 15-bit exponent, plus a bit for the sign. Although the Cray-1 does not have separately addressable internal registers, for multiplication it has an effective internal mantissa of 92 bits. Thus mathematical accuracy, a major concern of scientific computing, is comparable between the two computers. The Cray has a wider

Until recently, the computational needs of the scientific community were met with the biggest and fastest computer that electronic technology could produce.

eight 80-bit registers, the Cray-1 has a total of 152 programmable registers separated into five different types, each dedicated to a specific activity. This amounts to more than 4K bytes of registers. A special feature of the Cray-1 is its eight-vector registers, each consisting of a stack could be used as a "vector" for chained operations.

Both the PC and the Cray-1 can perform their floating-point operations at the same time as operations that do not affect the same memory locations. Senarately identifiable instructions for the 8087 can run while the 8088 is also operating. Similarly, separately identifiable Cray-1 vector instructions can be executed while other operations, even other vector operations, are also running. Properly "optimized" scientific code, of which a high percentage of total execution time is for mathematical computations, can perform many of its nonmathematical operations "for free" in parallel while the computing is going on. To take advantage of the similar PC hardware feature, you may have to modify the generated machine code to permit the 8088 to perform significant work while the 8087 is computing. On the Crav-1. you can specify in the FORTRAN code that this parallel computation feature is to be used

The factor of 1,000 pops up again when you compare the two computers' hardware speeds in performing mathematical the data vector increases.

operations. Their manufacturers list instruction times for both computers in integral ticks of an internal clock, but the measurement unit for the PC is 1,000 times larger than that for the Cray-1 (see Figure 2). The 8087 clock ticks every 0.2 microseconds, while the Crav-1 clock ticks every 12.5 nanoseconds. Intel lists the average time for the 8087 chip to perform a long real number multiplication as 27 microseconds. Cray Research lists the average time for Cray-1 to perform a scalar multiplication as 87.5 nanoseconds. For one mathematical operation in a series of operations performed using the vector registers and instructions, this performance time approaches 12.5 nanoseconds (a result every clock period) as the size of

Software

When you compare the software available on each computer for scientific use,

Data Type	Bits for Exponent Mantissa		Significant Digits	Range (plus or minus)	
8087 Long Real	11	53	15 or 16	4.19E-307 to 1.67E308	
8087 Temp Real	15	64	19	3.4E-4932 to 1.2E4932	
Cray Real	15	48	14 or 15	4.58E-2467 to 5.45E246	
Cray Internal	15	92	27	4.58E-2467 to 5.45E246	

Figure 1: Haw the range and accuracy of the Cray-I and the PC compare in representing complex floating-point numbers.

standard exponent range, but the PC stores more significant digits and computes with equivalent accuracy.

Even the instruction sizes and operations of the two computers are similar. Instructions for both the 8087 coprocessor and the Cray-1 are either 16 or 32 bits in length. Both machines are register oriented. While the 8088 has only eight 16-bit general registers and the 8087 has only

set of 64 64-bit registers. A single vector instruction can multiply all 64 numbers in one vector register by the respective 64 numbers in a second vector register and store all 64 results in a third vector register. Cray-1 Fortran DO loops are carefully constructed to take advantage of this hardware feature

In a much more limited but similar manner, the 8087 internal circular register

Operation	8087 (microseconds)	Cray (nanoseconds)
Clock period	0.2	12.5
Multiply	27	12.5 to 87.5
Divide	39	40.0 to 262.5
Add	17	12.5 to 37.5
Store	18	12.5 to 50.0

Figure 2: Execution speeds of CPU functions for the Cray-1 and the PC.

you can see some basic similarities between the two. Both have a FORTRAN 77 compiler for scientific code, an assembler for machine code optimization, editors to help construct and maintain the code, and operating systems to run the whole show. Both manufacturers have also announced that a UNIX-like operating system will soon be available for their machines. That is where the software similarities end. Because the number of PCs sold is so huge, many individuals and organizations are writing software for this lucrative market. Nearly all of this software is designed to be "user-friendly." Even the PC software specifically designed for scientific use emphasizes interface with the single user.

Conversely, software for the Cray-I has primarily emphasized computational speed at the expense of ease of use. Further, because of the Cray-1's high cost and tremendous speed, its software has been designed for multiple simultaneous users. It has often been said that a Cray-1 is only for "friendly users" which is not the same as "user-friendly." In fact, the first Crav-I installed at a scientific laboratory was delivered essentially without an operating system or a compiler. Although Cray Research now offers a complete line of software, and some additional software, including operating systems and compilers, is available from the Cray user community, Cray-1 computers are not a volume software market. At a Cray Users Group meeting this past fall, Cray Research listed only 41 Cray-1 installations in the United States and 22 more worldwide. The only significant places where individuals are writing software for the Cray-I are the few national research laboratories and at Cray Research itself. As new generations of supercomputers suppliant the existing machines, they will require completely new software to run them. I expect this trend for speed at the excenses of user interface to continue.

The scientific community's need for

direct user interface with Cray-1 codes is so acute that some scientific laborators scientific laborators scientific laborators scientific laborators scientific laborators have replaced Cray Research's batch operating system that the saint system. Code scientific laborators active operating system that the operating system that the operating system that the compared of the spile compared of th

standard editors that do exist for the Craylare not much different or more sophisticated than the PC editor, EDLIN. Since more than 10,000 times the number of PC's than Cray- Is are installed, user interface software products, which are so labor-intensive to produce, will continue to be more widely available for the PC than for the supercomputer.

Input/Output

In addition to size and speed, the greatset difference between the Cray-1 and the PC is in their input/output methods. The PC is designed with I/O in mind. Its ROM includes drives for the keyboard, console screen, disk, and printer. Connectors on the back of the PC permit direct attachment of all kinds of input and output devices, including scientific laboratory hardware.

Cray Research designed the Cray-1 to communicate only to another computer, such as Cray's own I/O subsystem. This other computer must in turn talk to you or to other I/O devices such as an operator's console or a printer. Even those laboratories that have installed an interactive operating system on a Cray-1 need this additional computer to control the terminal interface.

Both computers have on-line disk capacity for data storage and 1/O, and here the factor of 1,000 returns (see Figure 3). Where the standard for the PC is a floppy disk, or for the XT a 10 million byte hard disk, the Cray-1's hard disks can store 606 million bytes. Twenty such disks are com-

	PC Floppy	XT Hard	Cray Hard
Capacity Megabytes	.36	10	606
Quantity	2	1	20
On-line Megabytes	.72	10	12120
Data Transfer (Megabits per second)	.25	5	38.7

Figure 3: Data storage capacities of the Cray-1 and PC.

A DELICATE BALANCE

monly connected to a Crav-1, which means it has 1,000 times as much on-line storage as an XT. Further, nearly all Crav-I computers are connected to a multiple computer network that can directly transfer and store files onto other computer systems. A typical floppy disk drive can transfer data as fast as 250 kilobits per second, or a hard disk at a rate of 5 megabits per second. The transfer rate of a Cray-1 disk is 38.7 Mbits per second, which is considered so slow that it is a major bottleneck in the system's functioning. Many PC vendors sell RAMdisk software to increase the data transfer rate to the I/O bus limit of 9.5 Mbits per second. Cray Research offers an I/O subsystem that acts like RAMdisk and will speed the Cray-1's data transfer rate to 850 Mbits per second, over 1,000 times that of a floppy disk.

Usage

The best uses for the Cray-I and the PC to support scientific research became obvious when you consider their unique characteristics. Although each is superior in its own particular area: both are used for code execution, data input, and data output.

With the emergence of standard scientific PC FORTRAN compilers, many scientists are beginning to use PCs to run at least parts of some scientific programs. At a scientific laboratory, it is common for people to write FORTRAN programs in a clean, standardized dialect of FORTRAN so they will be easy to compile and run on many different computers. As a test example, I converted the Sandia National Laboratory's set of benchmark programs to run on the PC. I subdivided a large "common block" into three smaller blocks so each would be under 64K. I could compile and run this set of codes on the PC with an 8087 coprocessor. Since at most laboratories, Cray-1 computers are used to the fullest extent, many people are interactively writing, debugging, and running small pieces of standardized Cray-1 FORTRAN code on a PC. Using a communications package, the developed code is then uploaded to the central computer network

The PC is enormously helpful in preparing scientific reports because it can directly combine the downloaded results with explanatory text.

where the Cray-1 will make the longer production runs.

A 1-hour job for the Cray-1 may take more than 40 days and nights on a dedicated PC, but a scientist might not get back a 5-second test for an hour from a heavily used Cray-1 system. A PC could also deliver this test run in an hour.

Data Input

As I mentioned earlier, the Cray-I needs another computer to feed it input data. In many laboratories, the PC is now used for this purpose. Often, the PC must perform three very different I/O functions. First, a PC may be tied directly to the laboratory equipment so it can electronically read and record test results. Second, the PC can be used to easily reformat that raw data into the form the Crav-I needs. Third, a communications program on the PC allows that data to be sent directly to the central computer network. It is because the PC is a full-scale computer in its own right, able to be as flexible as the programs it runs, and designed to interface with 1/O equipment, that this single piece of hardware can perform three such varied functions. A single piece of hardware performing all these functions eliminates the need for time-consuming data retranscriptions and conversions at each step. Because PC software is designed for the

user, the tedious chore of preparing data for the Cray-1 becomes much easier.

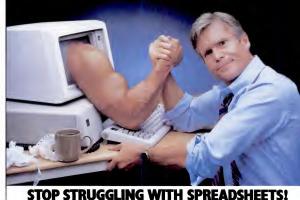
Data Output

The most significant use for the PC among Cray-1 users is in manipulating output data. Not only does the PC permit users to view both the numerical and graphical results of a Cray-1 job while it acts as a terminal, but it can download these results and manipulate them with its own software especially with sophisticated graphics packages. The PC is also enormously helpful in preparing scientific reports, not only because it runs word processing programs that can handle mathematical symbols and formulas, but also because it can directly combine the downloaded results with explanatory text. Since highly technical scientific reports are generally a clerical nightmare, this has been a boon to the scientific community.

Summing Up

The combination of the PC and the Cray-1 as important tools in scientific computing reflects the law of the excluded middle: There is a great need for the large and the small, but the in-between computer is neglected. Despite their differences the unique characteristics of the IBM PC and the Cray-1 make them both productive tools in the scientific laboratory. To take advantage of the Cray-1's speed scientists must modify their thought processes and program code to conform to its hardware architecture. In contrast, the PC's advantage is that its interfaces are easily modified to conform to the needs of both users and other computers. Harnessing these two machines as partners gives scientists the best of both worlds. The little userfriendly PC can help to solve problems on the big high-speed Cray-1.

Michael J. Hannah is a computer user consultant at Sandia National Laboratory in Albuquerque, New Mexico. He has been a technical consultant to computer users at various laboratories and in the Air Force for over 20 years.



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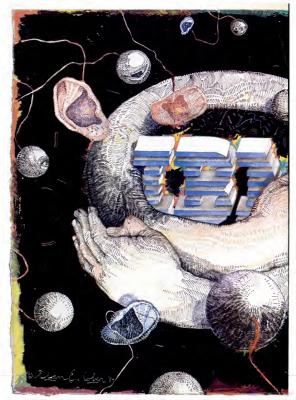
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Watching IBM for a Living





ceting room at New York's Plaza Hotel. Yankee Group founder and president Howard Anderson leans on a lectern, his face illuminated by a slide projected

overhead. "Watching IBM is like playing half-

court basketball with your best friend," the tall, curly-haired telecommunications expert remarks. "After a while you're able to predict its every move."

A hall full of management and planning executives from companies such as IBM and AT&T had paid Anderson's Boston-based consulting firm \$795 apiece for breakfast, lunch, cocktails-and 2 days worth of predictions about how Big Blue intends to play ball in the office and at home.

Within the personal computer industry is a community of analyst and industry watchers like Anderson who charge big money for their opinions, newsletters, and research forums. Most of them are young and articulate, understand statistics. Some of them even write well. No matter who they are, what they always offer is selfassured assessment of an industry that

Strong financial control is the reason Big Blue is blue chip on Wall Street.

everyone is trying to figure out. Industry analysts hold social gatherings. They make predictions. They even review products. But most of all they watch-they all watch IBM.

The IBM Watch

Twenty-nine-year-old Frank Gens, a former marine biologist, is "chief IBM watcher" at Anderson's Yankee Group and edits the firm's IBM newsletter, Impact: IRM. Gens uses a combination of inside information and data from the Yankee Group's database of industry statistics to develop his analyses. Most of all, he admits, he uses plain common sense. "(IBM) is a very intelligently and logically run company. It is not a technologydriven business but one that's controlled by the financial people," he says.

This strong financial control is the reason Big Blue is blue chip on Wall Street. and why most major brokerage houses have one vice president

> glued to a terminal 8 hours a day, watching IBM. "IBM doesn't just influence the market, it creates it."

Dyson, a 32-year-old former Forbes magazine reporter who purchased the 13-yearold Rosen Electronics Letter from venture capitalist Ben Rosen in June, 1983. "IBM is the sea in which we all swim."

Dyson's name gets around a lot these days, not because she is an expert on hardware or software, nor even because her stint as a Forbes magazine writer taught her where the money is, but because she works hard, writes with an edge, and knows how to talk to reporters. Before she bought the newsletter. Dyson was its man-

aging editor and a consultant to Wall Street firms.

The Rosen Electronics Letter was once the source for the inside scoop on the semiconductor business Dyson's version, which no longer covers semiconductors, is called RElease 1.0 and has 2.000 subscribers.

many of whom are holdovers from the semiconductor days. They pay \$395 a year for Dyson's chatty and opinionated publication.

A Good Story Despite her Wall Street background,

Dyson distinguishes between those who cover the computer industry for the industry and those who cover computers for the "big board." "My loyalty is to the computer indus-

try, not to the analyst community," Dyson explains, "I'm not interested in the stock prices. I'm more interested in the dynamics of the industry, marketing position, and market share."

There are similarities, she admits, between her activities and those of Wall Street analysts. "The truth is, even on Wall Street the real trick is to tell a good story, because no one knows what stocks will do. As long as you can make a good case for your story, the clients love you. but it's still storytelling. To some extent, so is what I do now.

In addition to telling her computer industry marketing and dynamics stories,

PC MAGAZINE • MAY 15, 1984



Dyson also bills \$2,000 a day for consulting, a high fee for someone who finds hardware "boring" and who refers any client who asks for statistics to her colleague Portia Isaacson of Future Computing, located in the Dallas suburb of Richardson, Texas,

Portia Isaacson is a homespun and determined woman who has a pure computer pedigree in an industry full of halfbreeds. She began with a Ph.D. in computer science, worked in private industry as an engineering manager for microprocessor operating systems and computer architecture, and later opened Texas's first computer store in 1976. She is also the mother of three sons and, not incidentally. the wife of Dr. Egil Juliussen, a leading business analyst and forecaster. "You might say Egil is our product and I'm its salesperson," Isaacson says,

In a little over 31/2 years, she has built Future Computing from a company with two employees (herself and Juliussen) and no capital into one with over 100 employees that expects to do \$9 million dollars worth of business in 1984. The commany runs five different newsletters (for each of which it charges about \$400 per year). nublishes various reports (about \$300 each), and offers a range of personalized services to both manufacturers and end nsers

One of Future Computing's latest ventures is an IBM PC compatibility lab that

will test any machine to determine how "operationally compatible" it is with the PC.

The computer is subjected to a battery of tests and run with over 50 different software programs. Its documentation is picked apart. The end result is a 50-page written report on the product, with a price tag of between \$5,000 and \$7,000.

The machines that have proved to be the most compatible so far are those that have been on the market the longest, such

A Few High-Priced Words

What business wisdom could possibly be worth \$2,000 to \$3,000 per day? Here is a sampling of opinions and projections from the analysts that even IBM goes to for advice.

n the 20 years since the word processing market's inception in 1964, about 2 million workstations have been delivered. In 1983, IBM delivered about 700,000 PCs. We estimate that at least half of them ended up as workstations in large companies. If you add to this number the IBM compatibles used as workstations, about 150,000 machines, you'll have a total of some half million workstations. In 1984, it's estimated that IBM will deliver 2 million machines, one third of them PCirs and the rest PCs and XTs. By the end of 1984, probably as many PCs will be used as workstations as all the word processors that have ever been delivered. The old model of office automation, which said that offices would expand from word processing by adding functions, is probably now incorrect."

"IBM is working on a high-end workstation for a 1985 announcement. I'm fairly sure it's a UNIX-based product and I think what IBM is doing is very clever. By first releasing UNIX for the PC (PC/IX), it will create a marketplace in which a lot of applications software for that workstation will be written in advance of its announcement. I feel that PC/IX represents a bridge for the PC user to the next level of systems to come."

"We're pretty positive about the PCjr. It's hard to make predictions about it.

although we have said we think it will stimulate enough demand in the market to sell a half-million units. But the puzzle, we think, is the shortage of 8088 chips; where will IBM use the chips it has? The first year of PCir production and sales will be determined by IBM's chip allocation."

Frank Gens, The Yankee

"I think you'll soon see less-expensive versions of the XT/370 that will cost somewhere in the \$5,000 to \$6,000 range-for example, a VM (virtual memory) machine that can run different guest operating systems, such as UNIX, DOS, and CP/M. IBM is pushing VM as a rival industry standard for microcomputer operating systems against DOS and CP/M. I can predict that within 2 or 3 years VM is going to be one of the major PC operating systems."

"I don't envision a \$5,000 workstation being able to do some things, such as database management, until 1988 or 89. Now, to run a real relational database, you have to go to a machine with the power of a DEC VAX or Data General minicomputer. I think the proliferation of PCs will fuel the growth of minicomputers over the next 3 or 4 years, contrary to what most people believe. I think the minis are going to change. They will become controllers for clusters of microcomputers. But in order to take advantage of the clusters of microcomputers, mini vendors will have to drive their prices closer to \$20,000 to \$30,000.1

as the Columbia and Compaq models, Isaacson discloses. Normally, she adds,



Confidentially

Their access to information places computer analysts in a uniquely awkward predicament.

Even if they sign nondisclosure agreements, how can analysts omit from their commentary inside information they know? Even if they do not directly reveal it, the information will affect their analyses.

Amy Wohl of the Bala-Cynwyd, Pennsylvania-based firm Advanced Office Concepts admits, "You have to walk a "About half of our customers would not consider a non-MS-DOS machine under any circumstances."

thin line. Each vendor or user company you work for realizes that you know a lot about its competition. But it also knows your reputation for ethics and discretion."

Does the security-conscious IBM trust Wohl and her peers?

"They see us as necessary nuisances, I think," Wohl says. "Some of us do considerable consulting for IBM, have many contacts at IBM, and so know a lot about what IBM is planning."

IBM can also use this exchange of

resources, getting all of IBM to work together is like trying to get the Japanese electronics companies to work together. IBM's corporate staff is probably finding the various divisions a little more independent than anyone really likes. One part of IBM has just adopted interactive UNIX; are the others going to fall in line?"

"I think the PC is going to decline into a secondary role as IBM comes out with new hardware, the way the Apple II did. Not that IBM will stop making it, or that it will stop being a standard for which a lot of software is written, but the sex appeal, razzle dazzle, and focus of attention will move elsewhere.

"IBM is saying, under its breath, that UNIX is not an AT&T standard, it's an industry standard. Simply by being there with PC/IX, IBM takes some of the power from AT&T."—M.P.

knowledge to its own advantage, however—several analysts say they may have been used to leak information to the press and Wall Street.

With her partner Dr. Howard Morgan, a former professor at the Whatron School and a longtime researcher in the computer industry, Wohl, 42, has built a specialized consulting practice in the office automation field that until recently dealt very little with 1BM. The emregence of the PC workstation and Big Blue's recent marketing push in this area has made Wohl an 1BM watcher by default.

While at McGraw-Hill, the publishing company, Wohl did market research and vendor analysis for office automation clients before the industry existed. Those clients were the firms that would ultimately create the marketplace. This experience led her into business for herself, and today her services are available for \$2,000 per day. Her newsletter, Advanced Office Concepts (AOC), costs \$135 per year, she publishes three Market Guides that are updated monthly, and her company is currently working on an end-user consulting job that will ultimately select 6,000 workstations for a corporate site. What story does she tell for her high stipend?

"People are switching from top-down the workstation, to bottom-up design, in which you pick workstations and then find systems that will work with them. That change in strategy, of course, has resulted from IBM's success in selling the microcomputer to the business word." Wohl

The basis of such commentary is more than sheer intuition; part of any analyst's job is collecting statistics.

says.

Recently, AOC contacted 25 of its largest customers to ask if they had yet chosen one personal computer or personal computer environment as a corporate standard. All 25 replied that they had standardized on the IBM PC or, in a few cases, another MS-DOS machine. "About half of our

Patty Seybold, The Seybold Report

"If you're planning to automate your office, you have a choice between putting in a multimillion dollar office system now and worrying about whether you made the right decision, or sitting tight and handing out PCs as a stopgap measure—the latter is what people are typically doing now."

"Apple has a future, but I'm not sure how important a niche it will have in the office marketplace. If Apple makes large OEM deals with major minicomputer makers to supply office automation systems, it may make a difference."

Esther Dyson, RElease 1.0

"IBM will become much more aggressive in software. One way or another, it will enter the applications business. How precisely IBM will do that is a subject of much nervous discussion. Despite its

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customers said they would not consider installing a non-MS-DOS machine under any circumstances," observes Wohl.

This kind of market presence is quite an achievement for a company that 3 years ago was invisible outside the typing pool. Nevertheless, Frank Gens sees the PC's entire development as simply a "fortuitous series of events" for IBM.

"Apple and Tandy Computers had been making their way into offices. Whenever anything happens in data processing at any level in companies that are IBM's large accounts, IBM notices. The PC was first developed as a defensive product. Then all of a sudden, IBM recognized that its micro was a darned good revenue whick:"he says.

Patty Seybold, the Boston-based editor of the Seybold Report on Office Systems and Prefessional Computing, maintains and ITM and a long way to go in the market. "IBM has a well-defined but rather show strategy, which is frustrating to users. For example, it doesn't yet have the departmental Office system network that everybody wants." Seven years ago, Seybold began the family company's own processing newsletter, Today, for \$1,200 at day, she offers critiques and analysis.

What the Experts Buy

Every IBM watcher needs at least one PC for reviewing new software. But what other machines do these microcomputer consultants purchase for their homes and offices?

Like movers and shakers in many growth businesses, IBM watchers themselves are constantly shopping and spending for new equipment. A range of computer hardware and software arrives in their offices for testing, but what machines do they purchase themselves?

Their decisions are based largely on the software they must review for their clients, so at least one IBM PC is standard equipment in every office. For example, Amy Wohl's staff of 14 works on a range of IBM and CP/M machines. However, as far as a corporate system is concerned, Wohl is still looking.

"We were hoping that someone would come out with a product highly compatible with the IBM PC that was cheaper, because we don't particular care what the brand name is, we just care if it runs IBM software successfully. But so far, we haven't found what we are looking for, so we may have to go out and buy IBM PCs," says WOIL

What she really wants, she adds, is an IBM local area network, since her company uses a variety of databases ranging from information about hardware and software to mailing lists and subscriptions. Currently she has an XT stationed in her office, an assortment of word processing equipment, and a Franklin and an Apple Lists to work with at home.

Frank Gens recently picked up an IBM PC for home use, although the Yankee Group headquarters is equipped with IBM, Wang, DEC and Apple computers. The company's production work is done on a Wang word processing system, although Gens admits, "We're

y quickly outgrowing that and our applicars tions are requiring more computer."

"There was a bit of controversy call it active discussion—at the Yanso—at the Vanso—at the Vanso—at the Vanso—at the Vanso—at the Vanso—at Vanso—a

No one wanted to peg his or her allier Dyson's office is equipped with an Apple III for word processing, a Lisa for graphs and pictures, and PCs and Compaçs to run 1-2-3 and PowerBase. The Seybold offices use a slew of IBM PCS and Koodk's Acter Publishing System.

"There are a lot of machines to choose from," Gens makes sure to mention before the interview tape runs out. He is echoing the neutrality of many of his peers.

I hope that's not all they tell their clients.—M.P.



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topics ranging from office automation to word processing.

Predictions

When or if IBM will develop an advanced office network is what customers want Seybold and her colleagues to tell them. To a great extent, making accurate predictions is what the computer analyst's job is all about. For example, Seybold predicts that IBM will release a word processing keyboard for the PC this spring.

In 1979, the Yankee Group predicted that an advanced workstation would emerge. That prediction predated the application of the microcomputer in the workplace. According to Gens, a number of clients partially based their plans on that

Two weeks after the IBM PC was first introduced, Future Computing predicted its success with a white paper called "IBM's Billion Dollar Baby." Portia Isaacson still quotes those initial figures.

"We predicted what would happen in the market very specifically-we foresaw the IBM compatible phenomenon and that



"One thing that really matters in this

business is the ability to get people to sit down and talk to you.

dard. We predicted that IBM would introduce the hard disk first, but it came out later than we thought it should have. The IBM home computer version also arrived a little later than we expected."

It was its forecasting aspect that first attracted Esther Dyson to market analysis. "It mattered whether I was right or wrong in my work, not just that I told a good story," she says. She predicted that Apple's Lisa was flawed and that Digital Equipment Corporation didn't know the first thing about retailing.

Why, in a predominately male industry, are so many successful IBM watchers women?

Dyson explains, "One thing that really matters in this business is the ability to get people to sit down and talk to you. Being a woman helps."

Portia Isaacson has her own explanation: "Maybe we're just easier to remember," she smirks. "All you men look alike."

The analyst's life is a busy one. Dyson is based in New York City but spends at least 21/2 weeks on the West Coast every month. Amy Wohl is on the road 3 days a week. The schedules of Jean Yates (a San Jose UNIX expert whose stock as an industry watcher has jumped since IBM's PC/IX announcement) and Patty Seybold were so crammed that my interviews with them had to be put off for weeks at a

"What makes you good in this business," advises Amy Wohl, "is the constant fear that you're getting out of touch. You're always running to keep up with what's going on."

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The ccording The future of

Group

ecomputers in business is assured. This consulting group, who are paid to predi So say the members of who are paid to predict the technological destinies of their corporate clients.

hatting with members of Gartner Group is an excursion into the future. They speak of artificial intelligence, electronic imaging systems, and component integrated workstations with such matter-of-fact conviction that it's hard to remember that these systems, for the most part, now exist only in engineers' dreams. But Gartner Group is no high-tech think tank or science fiction society. Major corporations pay millions of dollars to gain this consulting group's insights into the future of business technology. The future is not some pie-in-the-sky vision here, but the inevitable fusion of accelerating technological advances and social adaptation. At Gartner Group, it's

called strategic planning. Although the future may be predicted here, Gartner Group's modern office in Stamford, Connecticut, packed with laser printers and display stations, is hardly an appropriate setting for fortune tellers. The visions that emerge from Gartner Group reflect the work of a large professional staff with many years of experience in the information processing business. Their conclusions are fueled by torrents of statistical data, research on emerging products and trends, and consultations with hundreds of sophisticated corporate clients. Many of the principals in Gartner Group have made strategic product decisions for equipment vendors in the recent past, so they know the issues vendors face now, as well as those they will face in the future. Personal Computing is one of seven programs that the Gartner Group offers; Videotex, Office Information Systems, Telecommunications Service Strategies, Industry Service, Large and Small Computer Systems are the other topics to which The progression of technology and common sense point to the integration of multiple functions into a single device,

clients may subscribe. What does the future hold for personal computers? "Well," says Dick Imershein, corporate vice president of research, "there will be no more personal computers." Imershein takes obvious pleasure in watching reactions to this startling statement, but his intention is to distinguish between personal computing functions and what we know of as the personal computer in terms of hardware. In today's parlance, personal computer and microcomputer mean the same thing. But for tomorrow, Imershein forecasts machines incorporating multiple micros. The present generation of microcomputers will become obsolete and be replaced by more sophisticated products just as surely as the Model T gave way to automobiles with greater power and sophistication. "What we're really talking about," Imershein explains, "is the personal computing function: The ability for individuals to have at their work places-at home or in the office-the ability to increase productivity through the use of microcomputer technology. The functions will remain,

but the boxes that we know as personal computers will be gone."

Desk of the Future

On the desk of today's business professional you might find a telephone, a PC, a terminal to the corporate mainframe, and perhaps a tape recorder or transcription machine. The progression of technology. economics, and common sense point to the integration of these multiple functions into a single device. The convergence of new technologies like voice response, electronic imaging, and data retrieval will be a gradual process, but multifunction devices are already being introduced into the marketplace. The new IBM 3270 PC, which acts as both a micro and a terminal to a mainframe, is one example, Gartner Group and the industry that it analyzes refer generically to this new generation of high-tech business tools as "workstations."

The evolution from the general-purpose microcomputer of today to the multifunction workstation of tomorrow will culminate in fully integrated devices that will combine a variety of present standalone technologies: analog voice transmission (telephones), digital transmission (telecommunications), imaging (facsimile), and personal computing. The binding 'glue' and emerging user interface, according to Gartner Group, will be artificial intelligence (AI) in the form of voice response and recognition. The physical packaging of this integrated workstation will be small enough to sit on a desk, even a secretary's desk. These workstations will not be executives' and managers' tools



only; they will be standard issue for everyone in the company.

Imershein describes the scenario: "When you move into an office, the office manager will look at your job title and configure a particular system for you. You'll go down to the stock room and an employee will test it, hand it to you, and say 'Here, take this back and plug it in.' What you plug in may be different from what the person in the adjoining office plugs in." Imershein thinks that workstations will be modular, with a variety of display devices, keyboards, communications, and other functions that users will be able to mix and match. Workers who process a great deal of text might get flat monochrome screens that can display multiple pages and keyboards designed for efficient text processing. People who work with graphics might get the same central component but with high-resolution bit-mapped color screens. "Users will have a plethora of components from which they can pick and choose and assemble," says Imershein.

IBM Watching

nate the marketplace, keeping an eye on that company is one of the key focuses of Gartner Group. The group's reputation in business and trade publications as the leading "IBM watcher" is due to insightful analysis by a professional staff, many of whom worked for Big Blue before coming to Gartner Group. Imershein spent

Because IBM and its products domi-

more than 30 years with IBM. His most recent position there was in commercial analysis, evaluating competitors' products against IBM's own.

against IBM's own.
IBM competitions, both compatible and noncompatible, live in the giant's shadow.
Compatibles face a particularly policy is shadow.
Compatibles face a particularly policy is existence. Jack Karp, director of Gartner Corqu's Personal Corquiring service, believes that once IBM solves its delivery shad once IBM solves its delivery shadow.

The competition of the compatible of the competition of

Gartner Group analysts, like many information industry watchers, feel that Big Blue has an array of products ready for manufacturing that it will introduce when the market is ripe, including lighter units—perhaps not true portables, but

Once IBM announces its next round of price cuts, the compatibles will be severely squeezed.

what Imershein calls "luggables." One of IBM's stated corporate objectives is to compete in all areas of the industry. Once a market niche grows to a certain size or range of profitability, IBM's entry is just a matter of time. Imershein points to the

Independent Business Units (BBUs), which are small entrepreneurial start-up companies that belong to BBM but operate outside the bureaucnite framework. They are shielded from IBM's massive corporate hierarchy but are backed by its ero-mous financial, technical, and manufacturing resources. BUB have accomplished unique withly in gowing, profitable, notarticular through the profitable of the profit of the p

IBM presents a different challenge to noncompatibles: persuading software manufacturers to produce applications for them. Apple's Macintosh is a prime example. Karp is enthusiastic about the attributes of the machine itself. "Wait until you see the resolution on the screen," he marvels. "If I could go out tomorrow and buy 1-2-3 on a Macintosh, I would do it. I have an IBM PC on order, but I would chack it in a second."

Entry Systems Division.

But the key word here is ff. When it introduced the Macintonh, Apple announced that I S0 major and Variety and the announced that I S0 major and Variety and the control of the Composition and MicroPro had agreed to provide applications for the machine of the provide applications for the machine of the ware furnimaries like Mitchell Kapor and Bill Gates appeared on promotional materials to demonstrate their commisment. But Karpi sway. "The and the same thing about Apple's Lisa. A hundred software vendors had been signed to where

is the software?"
Although Karp does not doubt the earnestness of Apple and the software houses in developing applications, good intentions do not automatically lead to quick



results. Software developers welcome new entries in the hardware arena; the more machines that can run their programs, the more potential for sales, Strategically, these developers need to become less dependent on IBM. But Karp points out a number of signs indicating that Macintosh applications may not be delivered in the early months critical to the machine's success. Lotus is already late with 1-2-3's followup, Symphony, and VisiCorp is late with Visi On. IBM is introducing new products every several months, and, says Karp, "not too many software houses can afford to fall too far behind with IBM. I'm not denying that these people have made a commitment to Apple to produce software. I guess I'm questioning the time frame."

Clear Skies

However, Gartner Group does not forecast certain gloom and doom for noncompatibles simply because these manufacturers haven't jumped on the IBM bandwagon. The wildfire success of IBM in the microcomputer marketplace does not mean that every workstation must run MS-DOS. Rather, Gartner Group advocates that buyers remember the fundamental adage: Know your requirements. "The only reason to be compatible." stresses Imershein, "is to have access to the software." If a machine offers the productivity tools a company needs with added attractions like a lower price or a better interface, compatibility isn't an issue. For the user, a micro's potential to increase productivity should be the criteria. At higher levels in an organization, other factors in the acquisition decision become important-serviceability, training, and

the growing need to interconnect, particularly with the corporate mainframe,

The abundance of approaches in hardware and software design, while a nightmare for buyers, accurately reflects the uneven adaptation of new technologies by society. User interfaces are a prime example, Manufacturers of mice, touch screens, and pads are claiming superiority to keyboards. Will one of them become the new standard or will they all follow the path of light pens to become interesting but minor variations? The problem is, says Karp, "although we know intuitively that Apple's Lisa is a better interface than CP/ M or MS-DOS, ultimately we don't know what a good human interface is." Gartner Group believes that IBM, which has been criticized for not providing leadership, is watching the market for favorable and

VisiCorp and Microsoft are corporate gladiators in the struggle for supremacy in user interfaces.

unfavorable reactions. Only after it is convinced that the market acceptance potential is there will IBM commit its massive resources to a product.

The software industry is also seeking better user interfaces. The hot ticket today is environmental software—operating systems that feature multitasking, integrat-

ed applications and, most visually dramatic of all, windows. A windowing environment usually divides the screen into different boxes, each a mini-display for a different application such as a word processing program or a spreadsheet. By moving the cursor from box to box, you jump from the middle of one application into another. The process, Gartner Group analysts agree, simulates a business person's desk, which typically is covered with memos, phone messages, and reports, the flotsam and jetsam of day-to-day business. Windowing allows you to analyze data using a spreadsheet application, jump to a graphics generation application to produce a pie chart for dramatic illustration, and then jump to a word processing window to write a memo announcing your findings. As you move from one window into another, the new window enlarges and overlaps the prior ones. The effect is quite startling.

Interface Face-Off

The major players like VisiCorp and Microsoft are corporate gladiators with Microsoft are corporate gladiators strategle for supremacy in user interfaces. The designers and programmers in the designers and the properties of the designers and the marketing backs are drawing to the design of the designer industry in which each over the work brings new products that claim they work work brings new products that claim they would list the world on its heels. Environment software is a major step on the road to the integrated workstations envisioned by Gattner Group, but it must be a part of a pockage that's attractive as a whole.



Apple's Lisa was an early revolution in environmental software that did not succeed, primarily due to high price and lack of available software. The Macintosh, which features many of the Lisa's best features, is priced attractively but no deliverable software is yet available.

Imershein agrees that software availability is the key to the success of the Macintosh or any new micro. But he also sees some problems that may impede immediate acceptance by the established micro community. "Twenty years ago when the CRT was first available, we were taught that we could do only one thing at a time," Imershein reflects. "And for 20 years we've been looking at one thing at a time. Windowing is closer to the way we really work, though it's not the way we've been educated." The experienced workstation user of today may find the change unsettling. But computer-literate students, who are the business professionals of tomorrow, have no such imprint, and the major vendors are focusing their resources on getting to them first.

Although the office is still the biggest batteground, shools are developing into a second front. While selling to education a institutions is not as profitable as selling to businesses, users who are acclimated to a manufacture's products at an early age will be more inclined to use them later on in business. "Apple is moving with light may be a provided by the property of the pr

ties. "Once you're on a Macintosh or Lisa, you're not going to want to go to a user interface that's less friendly." IBM is taking action, he notes, by making agreements with several universities and schools. Its elite sales force is rewarded

While major software advances are looming on the horizon, Gartner Group foresees no revolutionary hardware products in the pear term

with additional bonuses for placements in educational institutions.

Another hot software issue involves UNIX. This multitasking operating system offers portability; application code written in UNIX can be adopted for a variety of machines from micros to mainframes. This enormous hardware base spells almost unlimited potential for software vendors. UNIX was developed by Bell Labs, part of AT&T. Gartner Group experts believe that AT&T will become a major force in the computer field and that its ace is UNIX, but they also believe that MS-DOS and its broad applications are not threatened by UNIX. Karp speculates that many different operating systems may be able to run concurrently on a worksta-

already has expertise in this field with its Virtual Machine (VM) software for System/370-architecture computers. The software "guests" other operating systems under the VM unthrellal operating system, partitioning out the machine resources to make each guest operating system think it has control of the entire system.

No Hardware on the Horizon

While major software advances are looming on the horizon, Gather Group sees no revolutionary hardware products approaching. Instead, cisting hardware will gain additional capabilities such as multifunction boards and perhaps phone patches that allow micros to act as voice transmission devices. An area that may make great strides in

the near future is communications. IBM's situation once again reflects that of the industry in general. Up until a few years ago, IBM had several divisions, each with its own R&D, manufacturing, and marketing, and each concentrated on a different segment of the industry. Depending on which division called on your firm, you could be offered a variety of word processing devices from the standalone Displaywriter to the shared logic 5520 system. Products were directed at specific office needs that they addressed successfully. What was missing was a unifying communications system. One kind of machine could not talk to another. Only recently has IBM begun to tackle this thorny problem by consolidating R&D from the dif-



cites Document Interchange Architecture (DIA) and Document Content Architecture (DCA) as proof that IBM recognizes the need to link the various parts of the office

While major advances are expected to close communications gaps. Imershein predicts that other hardware announcements will be improvements on existing products. He foresees developments in ink-jet printing, which actually sprays characters onto a page. Color ink-jet printers will become better and less expensive, offering higher speeds than today's letter quality printer and improved print quality. These devices, Imershein believes, will come from Japan.

Printing in Japanese

What discussion of the future of microcomputers would be complete without mentioning the role of the Japanese? Gartner Group analysts see the seeds of tomorrow in today's products; notes Imershein, "The Japanese already own the low-cost printing market. They are established there and the United States cannot compete." Similarly, displays and chips are manufactured in growing numbers in the Far East. The real question, Imershein believes, is when the Japanese will be able to sell a complete product. It is not for lack of product; NEC, Fujitsu, and several other Japanese companies already have micros in stores. Solving the problems of distribution, sales and service is perhaps a more formidable task than creating the hardware itself, especially when such areas are the chief strengths of American vendors, primarily IBM.

"Inevitability" is a recurring term at Gartner Group. The speed with which not

Imershein predicts that color ink-iet

printers will become better and less expensive, offering higher speeds than today's letter quality printer.

only technology but affordable technology is approaching shows no sign of slowing down. The boom in information communications may be tumultuous, but it is certainly not directionless. The future is, of course, inevitable, but Gartner Group believes that with careful analysis of technological developments and a solid understanding of today's business environment, the future is also clear





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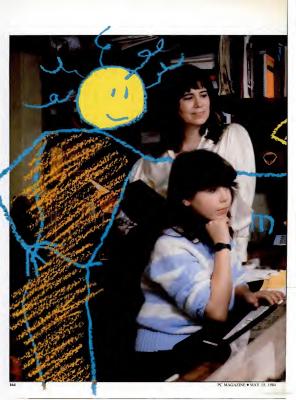
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CIRCLE 379 ON READER SERVICE CARD



Bank Street Writer Is a Family Affair

A mother and daughter writing team reviews a word processing program. Mother Lindsy, a PC contributing editor, gets the first word.

unike Cabbage Patch dolls. Froot Loops, or 117. Band Street Writer is a kids' product that even a parent could love. Designed in conjunction with the Bank Street College of Education in New York City (which helped cation in New York City (which helped is the best of develop the Head Start program in the Street School, it aspires to be a nonintimidating, easy-to-learn, hard-to-forget word processing program of young users. Despite a few flams, it is succeeds—and I suspect it will be grabbed up by legions of adults too.

It is also a surprisingly multifeatured program, considering its ease of use. It includes such sophisticated touches as global search and replace, function key macros, onscreen boldface and underline, multiple file printing, and the ability to undo block moves and erases, to name just a few. At the same time, the program is designed so that new users—who probably don't need to take advantage of the more advanced features right away don't even have to think about them.

Bank Street Writer comes with a SSpage paperbound manual and an on-disk tuntrial. (If you've ever used a word processing program before, you won't need either one.) The program is copy-protected, which means that it can't be loaded onto a hard disk, but you do receive two copies. If Bank Street Writer ever fails to boot up or otherwise perform, use you extra copy and mail the defective disk back to Brotechaud for a replacement.

Klutz-Proofed

A relatively klutz-proof installation program copies BASIC and PC-DOS files from your DOS disk onto the Bank Street

Mother Lindsy and daughter Sadie practice Bank Street Writer at home.



PC MAGAZINE • MAY 15, 1984

BANK STREET WRITER

Writer disk. (You need BASIC to run the utorial.) Once you have performed this installation, you need never trifle with your DOS disk again, since Bank Street Writer includes its own self-contained, easy-to-use versions of most of the commonly used internal and external operating system commands such as DIR, COPY, DISKCOPY, CHKDSK, RENAME, and FORMAT

To get started, you simply boot the program, type the letter T while it's loading, and then follow the onscreen instructions to remove your disk from the drive and flip it over. The tutorial on the other side of the disk includes seven lessons: "Getting Started," "Moving the Cursor; Adding and Delettin Text." "Usine the Social and Delettin Text." "Usine the Social writers had come up with something other than "The Gettysburg Address" for editing practice. I must have edited that speech in a half dozen different tutorials by now—whereas in this case the words to, say, Michael Jackson's Thriller might be more appropriate.)

When you actually stant Bank Street Writer, the program lands you in again that takes up most of your screen—an electronic clean slate. Omscreen prompts which was a stant of the stant of the stant for the cursor, and which keys delect. The Del key delects the text shead of it and the gray backspace key delects the text in back of it. Unfortunately, only the Del key delects the letter the cursor is actually on, a possible source of confusional. you check how much space is left in your file, measured in how many more words you can type. This feature can serve as a rough word-counter. Files seem limited to about 30K, which ought to be enough for most home uses. Crit combined with the left and right arrow keys moves you to the start or end of the line, and you can use Home and End to go to the top and bottom of a file.

Escape into Editing

modes, one for writing and one for editing. In the writing mode, which you automatically enter when the program starts, you'll see an onscreen prompt telling you to "Press Ese for Editing Functions." Press the Escape key and the top of your screen will then look like Figure 1.

Bank Street Writer is divided into two

You select from among these functions by pressing the tab key and advancing progressively through the upper and then the lower rows. When you land on the function you want to use, press Return. If you want to move a little faster, you can use shift-tab to move backwards or the space bar to move instantly between the upper and lower rows. Once you finish the editing chore you've selected, you have to press the Esc key to return to the writing mode. This two-mode system may make the program more manageable for children and other new users, and it's easy to remember to hit Esc to go into the edit mode, since all the commands you need to use are there. But I found it difficult to remember to officially leap back into the writing mode. Instead, I just started typing on the inviting clean-slate screen, and nothing happened-except a rude little beep that nattered at me until I noticed the onscreen prompt and hit the Escape key.

Within the writing mode, you can't tell from your screen what the final printed copy will look like, a possible disadvantage for users who are used to typewriters. To be fair, very few word processors have what-you-see-is-what-you-get capability. The editing mode, however, is organized with enormous attention to novices:

y y

n the writing mode, you can't tell from your screen what the printed copy will look like, a disadvantage for those used to typewriters.

Keys," "Erasing Blocks of Text," "Moving Blocks of Text," "Gopping Blocks of Text," and "Finding and Replacing Words and Phrases," plus an overview of other major features not covered in the lessors. Except for the fact that you can't move back a page to see what you've just learned, the tutorial is logical and clear. (I do wish, though, that the

Bank Street Writer Broderbund Software 17 Paul Dr. San Rafael, CA 94903 List Price: \$79.95

Requires: 64K RAM, one disk drive, 80-column monitor, PC-DOS. CIRCLE 730 ON READER SERVICE CARD

Another onscreen prompt tells you to "Press Alt-K for Keys." You get a picture of the IBM keyboard with the major Bank Street Writer keys (such as the tab and Return keys) specially marked. Then press the Return key and you'll see a list of more than a dozen other key and combination key commands. All of these are as logical as anyone could ask for. Compare Word-Star's inexplicably dubbed command for underlining, Ctrl-PS, with Bank Street Writer's perfectly sensible Alt-U. (Unfortunately, the program underlines the spaces between words in a block of underlined text unless you key in Alt-U before and after each word.)

Other Alt commands let you boldface (B), center (C), and indent (I). Alt-S lets

 SAVE first asks you if you want to save all of your text. If you don't, you can place your cursor at the top and bottom of the block of text you do want saved. You're then asked if you want to see a directory of the files on your disk and an estimate of how much space is left on your disk. Unlike the PC-DOS CHKDSK command, which tells you how much room you have in bytes, Bank Street Writer tells you how many more words you can write. If your file has been previously saved, you're asked if you want to save it under its previous name or whether you want to overwrite the previous file.

The program, in other words, holds your hand every inch of the way and makes sure you know what you're doing. This is undoubtedly a blessing for new users, but it takes its toll in keystrokes. The shortest Bank Street Writer equivalent of the WordStar command to save and return to the file, Ctrl-KS, would be Esc, Enter, v. v. v. Esc.

You can also save your file with a three-letter password so that no one else can retrieve it. (Actually, anyone who knows how to use the program can-but more about that later.) The password concept is a sort of digital diary key-a nice touch for kids.

- · ERASE asks you to place your cursor at the beginning and end of the block you want erased. The program then highlights the block (which can be up to 15 lines long) and asks you if you're sure before it goes ahead.
- · MOVE similarly highlights a block you've chosen, has you move your cursor to your desired location, then asks if you're sure you want to move.
- · COPY also highlights a block and cepies it to a new location in your file after asking if you're sure you want to copy it. · PRINT asks you a series of questions and has a series of default answers, thus allowing you to simply continue pressing the Return key if you're performing a routine print job. This is one example of the program's successful blending of power and simplicity. First you're asked if you

A Kid's-Eye View

Bank Street Writer was developed with kids like Sadie in mind. This WordStar. veteran finds it a perfect fit.



Sadie Van Gelder he first word processor I ever used was the one at my father's office. I was introduced to it when I was 7 years old-6 years ago, Spending every other Sunday with a VDT, I learned to somewhat manipulate the controls for my purposes. Then, when I was II, my mom got an IBM PC and with it a word processor called WordStar. I had to learn more complicated functions and a lot of commands. We had to keep our manual hanging above the computer so we could keep the commands close by. Now, 2 years later, we have been introduced to Rank Street. Writer. It's a word processor for kids-

but a lot of adults who are friends of my mother's would rather learn Rank Street Writer than "adult" word processors.

Actually, I have to rephrase the previous sentence-there's no such thing as learning Bank Street Writer: All the commands are on your screen. When we got WordStar, I couldn't use it for a few weeks because I had to learn the commands. When we got Bank Street Writer. I wrote a letter the first day.

You can change the program to suit your own purposes; by deciding whether to run it on your monochrome or graphics monitor, by deciding your line spacing, by deciding the shape of the cursor, and more. You can also use the 10 function keys to carry out whatever command you want. But the best part of all is that there are almost no commands to memorize. Aha! Almost no commands to memorize, you say. But don't be fooled. Whenever you want, you can get a list of commands used and a picture of your keyboard showing you the keys most frequently used! No need to type with one hand and hold your manual with the other. And the commands are simple and easy to memorize (for example, boldface is Alt B and underlining is Alt U).

BANK STREET WRITER

(A KID'S-EYE VIEW continued)

An analysis of the second seco

One thing I don't like about the program, however, is that when you turn it on, you automatically go into a clear working space. If you want to go back to something you had been doing before. you have to bring it into your work space. In WordStar, you are faced with a menu when you get started. You can type in the name of an old file and then go into that file. In Bank Street Writer. you have to press the Esc key while you are in a new work file (which you are automatically placed in when the program begins) and then use the Retrieve function to bring your old story into your new work space. Then you are faced with questions like, "Would You Like to See a Catalog of Files on the Disk?" I think it would be easier if, in the beginning, you got a menu and you could use Retrieve to get into your old story immediately. This isn't really that much of a problem, but it's annoying to me.

Another aspect of the program that I don't like is that a password can ofton't like is that a password can ofton't like is that a password can ofton the three letters long. I guess this doer make some sense, because it might be hard to remember a long password, but I wish there wasn't a limit to how long the password could be. Anyway, if you do forget your password for a certain file, your flow with their passwords. I do, however, like the idea of having a password protect your files.

Another thing I don't like is that when you set for double spacing, it doesn't show up on the screen as doublespaced—you can only see the double spacing when you print out. I don't know

s spacing when you print out. I don't know why it does this, because unlike another word processor I've used, it shows right non your screen when you have done underlining or boldfacing, which is something I like.

Taking a Cue from Games

The whole key to computers nowa-

want to print all of your text, and then if you want to print your current text as a continuation of your previous print job (this is useful if you want to link files). You can number your pages beginning with 1 or not, insert a short heading or footer, and stop your printing either at the very bottom of your last page or exactly where you stopped printing on the page.

You can also see onscreen where each printed page will begin and end (and edit out widows or orphans, if you like), and you can print to screen or disk as well as to your printer. After printing out, you're asked if you want to print another conv.



ank Street Writer

would be a good word processor for a family, especially for one that has just gotten a computer, because both an adult and a kid could use it

days is that they're user-friendly. It's pretty common to make a user-friendly game (i.e., letting the user decide what keys they want to use for certain controls), but Bank Street Writer is the first user-friendly word processor? I've ever encountered. If more people decide to make their software as user-friendly as Bank Street Writer, computers will generally stop producing so much "oh my god, did I mess up?" anxiety.

Sadie Van Gelder is a free-lance writer who has published articles on computers in Enter, a computer magazine for kids, and PCjr. Magazine.

- CLEAR asks you if you want to emeyour text, which most people would interpret as a telect to no-RAMS-lead. It there has his you want to clear all of your text and whether you're sure. What the clear command actually does, however, is simply clear the screen. If you've already saved your file, it will remain saved. If you haven't adoy to then have the choice of your haven't and you then have the choice of the proving cortensing. Since the comtraction of the proving cortensing. Since the comference of the proving cortensing since the comference of the proving cortensing since the comference of the proving cortensing since the comference of the province of the province of the province of the files. It might be confusion at files.
 - RETRIEVE asks you if you want to see a list of files. You type in the name of the file you want and its password (or the Return key if it doesn't have one).

- UNERASE lets you bring back a block of text you've just wiped out with the ERASE command. This is a wonderful feature for first time users, but since a texits, I wish the programmers had left out the "are you sure?" in the erase function.
 Hand-holding sone thing, but this is more like wearing a belt and suspenders at the same time.
- MOVEBACK lets you move back a block of text you've just repositioned with the move command (after being asked if you're absolutely positively certain you want to). More suspenders here.

FORMAT lets you easily set tabs;

change line spacing (single, double, or triple space, but only one type of spacing per document); set left, right, top, and bottom margins, decide whether to pause between pages when printing; set the location of headings and footen; set page numbers (top of page, bottom, or none), their exact (top of page, bottom, or none), their exact left and right), and even whether they're printed as Page 1, 1, or -1-. Pethap're only proprint glarger 1, 1, or -1-. Pethap're to may proprint glarger 1, or -1-. Pethap're to

The format function also les you choose the logged disk drive, whether you want a block-shaped or underline-shaped cursor, and whether you want carriage returns to show on your screen. You can also install your type of monitor and decide how many columns you want displayed on your screen. The program makes good use of color monitors. However, even though text can be displayed at 40 columns. Bank Street Writer won't run

on a television set—a drawback that will undoubtedly lose it a certain amount of business among PC/r owners. Finally, the format function lets you install your printer, with defaults for the parallel printers most commonly used with the IBM.

• O'THER is an umbrella for a number of miscellaneurs, commands. You can delete.

heads. It can also speed up the process of selecting a job from the editing menu. For instance, to access the "other" function, you'd normally have to press the tab key five times. the space bar, and then the return key. Instead, you could program one of the function keys to perform that entire group of keystrokes. Such speed

_					
SAVE	ERASE	MOVE	COPY	PRINT	CLEAR
RETRIEVE	UNERASE	MOVEBACK	REPLACE	FORMAT	OTHER

Figure 1: When you switch from writing to editing mode, these functions appear on your screen. You move the cursor through them to select the one you want.

whole files (naturally, the program asks you if you're sure you want to), rename files, print a list of all the files on a disk on your printer (handy for indexing if you've got a large floppy library), format a disk (the program warns you that formatting erases old files), exit to DOS, or "quit to utility."

The utility program turns out to be still another umbrella of miscellaneous commands: copying whole files, copying whole files, copying whole disks, adding line feeds to a whole file (sometimes necessary for printing downloaded files), printing multiple files, and displaying a catalog of all your files with their passwords (see—your kids can't really hide their text from you after all).

Finally, you can redefine the PC's 10 functions keys through the utility program. I tried to rig Bank Street Writer-as I've rigged WordPerfect and WordStar with the Prokey macro utility programto perform long, tedious operational chores, such as saving a file by copying it from a RAMdisk to a floppy disk, running a word count program and then reopening the file and positioning the cursor at the end of it. Unfortunately, Bank Street Writer can't handle such exotica, particularly not strings of commands involving the Esc key. What it can do is redefine keys to represent strings of letters-such as your own address for making automatic letterfreakery is more the mark of the experienced techno-junkie than the brand new user, but it's nice to know that the capability is there if you ever want it.

The Man Behind the Writer

According to Franklin E. Smith, The man who designed the Bank Street Writer. the program was never meant to compete with \$500 business word processors. "At the time it was created, everyone was trying to outdo each other by adding hundreds of new features," he said. "Our idea was to go in the other direction, and build something transparent." The program got its start when the Bank Street School received a foundation grant to test the efficacy of using computers to help children learn to write. The premise of the experiment was that children might become less frustrated and more creative if they didn't need to labor over new copies of their work every time they made an error. Unfortunately, all the commercial word processing programs that the testers looked at were too laborious themselves to test the premise. Smith, a consultant from Cambridge, Massachusetts, headed up the

team designing a brand new program.
"The program was originally written
for the Apple," Smith said, "and we had
several design goals. First, the program
had to work on a minimally configured
machine—which meant 48K, one disk

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simple steps required to create, send, receive, display, list, name and rename files it even receives data completely unattended—especially helpful when you're sending work from home to the office, or vice versa. If you need it, there's always "helpful his feature explains prompts, messages, etc. to make communicating extra easy.

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BANK STREET WRITER

drive, and a TV set. Second, needless to say, it had to be easy to use—mot just something you could learn quickly, but something that you could learn, be away from for a few weeks, and then come back to and use without having to relearn it.

bestseller and was soon followed by Atari and Commodore 64 versions. Not surprisingly, the IBM version is superior to its cousins, combining the original design goal of simplicity with a lot of new muscle. "What we essentially did was put

he original Bank Street Writer was limited by the Apple's keyboard and by its inability to do both upper and lower case.

"Third, we wanted a program that didn't get in the way of the writing process. The best example is that when you boot up, you get a blank screen and you can just start writing. We paid a lot of attention to idiot-proofing the prompts, so you can't get lost wandering down alleys in the program. For instance, we always tried to think of what the most common uses were and we made them the defaults. As a result, we obviously made a very conscious trade-off between ease of use and a certain amount of functionality and power. This isn't a program for heavyduty professional writers, and it's not supposed to be."

What would be ideal would be a more multileveled program. For instance, I wish it were possible to turn off the pesky "are you sure?" which quickly starts scerning about as transparent to the writing process as a dead elephant lodged in your disk drive. Such a program would probably require more than 64K, but the day isn't far off when 128K will be the standard minimum IBM configuration.

The original version of Bank Street Writer was also limited by the Apple's keyboard and its inability, in its lowest common denominator configuration, to do both upper and lower case. Nonetheless, when the Apple version was released in January 1983, it immediately became a

back in a lot of the features—like the search and replace option—that we had to leave out to fit into the Apple minimal configuration," Smith said. The IBM PC version also reaped the benefits of ongoing research and updates of the earlier versions.

Working a Double Shift

Unlike Sierra On-Line's HomeWord, the official IBM word processing release for the PCjr, Bank Street Writer runs on both the PCjr and the PC—a real plus for people who own both machines.

At our house, the program has been a hit with 13-year-old Sadie (see adjacent story) and 10-year-old Miranda, but it's probably been a bigger hit with the numerous adults we know who are agonizing over buying a PC. Most of them are already overwhelmed by hardware, operating systems, and the very process of choosing and buying. They don't want extra complications at this point, and they blanch with horror when I proudly show off my debugged, ProKeyed, AST Super-Drive-driven WordStar, or even my WordPerfect that requires its own cribsheet templates over the keys to keep track of the commands. For new owners, even those who may move up to more complex word processing software, Bank Street Writer is an excellent investment.

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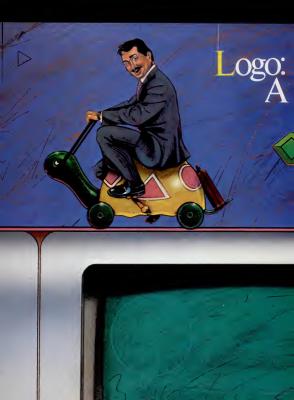
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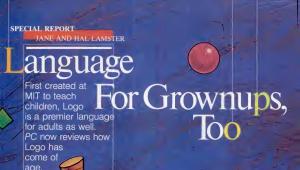


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the Swiss learning theorist Jean Piaget and inspired by what he had learned in the area of artificial intelligence (AI), Papert developed a tool to stretch and exercise young minds.

In the Logo environment, the child is given the computer as an experimental device. Papert understood that just as a pencil can be a child's tool for solving mathematical problems, composing poems, or simply doodling, so can a computer. Logo's special charm is that the user determines the direction, extent, and sophistication of the work-even if that user is only a child.

Logo promotes its creator's aim of cognitive development in two ways: First, it creates an environment where flexible problem-solving tools can break down large problems into smaller segments. These smaller segments can again be bro-

√ogo's charm is that

the user can determine

ken down into still more basic problems that can be studied, debugged, and solved. Individual solutions can then be reassembled into a solution to the larger problem This general approach is applicable to all problem solving.

Turtles Aren't Only for Kids

Logo's second and most visible innovation in the education of the young is the "turtle"-an enhanced cursor in the shape of a triangle. At some point in its development, the turtle changed from a small R2D2-like robot into a screen element that can be manipulated from the keyboard to create any number of shapes on the display.

The turtle removes some of the onus from many educational ventures-learning geometry, for instance. Rather than mastering an abstract coordinate system,

kids simply tell the turtle to move one way, then the other, to draw standard geometrical shapes. In turtle geometry, they need only imagine how the turtle has to move and then convert their insights into Logo instructions. To draw a square, for example, a child first pictures walking in a square: One moves forward some distance, turns at a right angle, and repeats this action a total of four times. The Logo procedure for creating a square 50 units on a side is simply

FORWARD 50 RIGHT 90 FORWARD 50 RIGHT 90

FORWARD 50 RIGHT 90 FORWARD 50 RIGHT 90

or alternately

REPEAT 4 [FORWARD 50 RIGHT

Compare this with explaining how to draw a square in any other general-purpose computer language, and you will begin to appreciate Logo's simplicity. Furthermore, this procedure can be used to create a square starting from any position. There is no need to modify it, as would be the case if one were working within a coordinate system. Teaching geometry to children is only one of the turtle's many uses. It also can

assist in exploring advanced mathematical concepts in topology, vector analysis, and curvature, as explained in a college-level text, Turtle Geometry, by Harold Abel-

the work's scope, direction and sophistication.

son and Andrea diSessa (MIT Press, 1981). Turtles are definitely for grownups, too.

Logo: More than a Turtle

Öther Logo features are also ideally suited for adult uses, in large part because Logo is a mature language that offers many techniques that are only marginally available in other languages such as BASIC, COBOL, FORTRAN, and PL/L. Logo supports GOTO-less programs, procedures with single outputs, descriptive variables, interactive debugging facilities, top-down programming, and prototyping.

Because Logo is descended from LISP, a list-processing language widely used in Al research, it handles complex lists of information with exceptional case. As a consequence, Logo programs manage text in surprisingly simple ways—for the benefit of children and adults alike.

One example of Logo's list-processing techniques is the generation of nonsense sentences. In order to develop such a program, 3 lists are first created; one for subjects, another for verbs, and a third for objects.

MAKE "SUBJECTS [MARY TOM JANE SAM SALLY HARRY] MAKE "VERBS [BUYS SELLS

MAKE "VERBS [BUYS SELLS BREAKS FIXES LIFTS DROPS] MAKE "OBJECTS [TOYS HOUSES CATS DOGS PENCILS COMPUTERS]

These commands will create three lists, each of which contains six members. These lists will then be referred to as :SUBJECTS, :VERBS, AND :OBJECTS when used in Logo. We now create a procedure to pick one member out of a list.

TO PICK :LISTOFMEMBERS OUTPUT ITEM (1 + RANDOM 6) :LISTOFMEMBERS

END

The PICK procedure takes one input, which we have called :LISTOFMEM-BERS. The procedure RANDOM 6 will output a random integer less than 6. The



ogo descends from LISP, a language used in Al research and designed to handle list-processing.

expression (1 + RANDOM 6) will then result in a number from 1 to 6. ITEM is a built-in Logo procedure that takes two built-in Logo procedure that takes two inputs. The first inputs the framether that takes two inputs. The first inputs to First in Sur or and-dom number and the second input to our under ninput. The first intil the tauth the proposition in Sur Insured First input to TIEM is our random number and the second input is our random number and the second input is our random with the sure of the sur

PICK : SUBJECTS

subject

and let's combine this statement with our verb.

SENTENCE (PICK : SUBJECTS) (PICK : VERBS)

Now we can combine the result with our object

SENTENCE (SENTENCE (PICK :SUBJECTS) (PICK :VERBS)) (PICK :OBJECTS)

The parentheses are included for clarity but are not needed. Abbreviating the word SENTENCE to SE, we can then put a PRINT command in front and end up

with:

PRINT SE SE PICK : SUBJECTS
PICK : VERBS PICK : OBJECTS

The result is a routine that will generate our nonsense sentence. We can make this a procedure called NONSENSE.

TO NONSENSE

PRINT SE SE PICK : SUBJECTS PICK : VERBS PICK : OBJECTS END

This procedure will generate one silly sentence.

TOM DROPS DOGS

One of the outstanding features of Logo is its ability to handle recursion, a procedure's ability to call itself. We can modify our NONSENSE procedure to be recursive, thus:

TO NONSENSE PRINT SE SE PICK :SUBJECTS PICK :VERBS PICK :OBJECTS NONSENSE

END

As a recursive procedure it will generate nonsense sentences forever.

TOM BREAKS PENCILS
SALLY SELLS TOYS
SAM BUYS COMPUTERS
HARRY DROPS HOUSES
JANE FIXES DOGS
SALLY LIFTS COMPUTERS

Despite the playful nature of these examples, recursion and list-processing are not children's toys. Logo is a powerful interpreted language, and the newer PC versions of Logo have opened it up to broad, general use.

The articles that follow will survey the current implementations of the language, including Dr. Logo, IBM Logo, and PC

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graphics, can cure many programmer's ills. But Dr. Logo has some ills of its

SPECIAL REPORT
JANE & HAL LAMSTER

T. Logo, originally known as De Logo, does not offer the best (see "DR LOGO". A New Star for Beginners," P.C. Volume 1 Number 11). Developed for the BiM P Cly Digital Research, Dr. Logo compares favorably with other implementations of the language currently available on smaller machines such as the Apple II, the Commodore 64, the TRS-Apple II, the Commodore 64, the TRSdeep of the prater power of the IBM P.C. Its black hap backs some of the "wooder drugs" or advanced capabilities of its competitor, BBM Logo.

This is not to say that Dr. Logo is a

programmer's witch doctor. With its superb turtle graphics, excellent procedure editor, and few, if any, intimidating features, Dr. Logo is like a friendly general practitioner.

This GP wants you to manage the health of your own programs, so it provides tutorial and reference manuals that enable even a novice user to begin creating programs almost immediately. The tutorial manual, Meet Dr. Logo, leads beginners through the language step by step, commencing with the most elementary instructions. Along the way, it highlights significant items with "Trailmarkers" that contain reminders and explanations. Especially helpful are the sample programs printed in two colors-green for what the user types and black for the computer's response. An explanation accompanies each entry.

The reference documentation is marred by inadequate editing. The index is incomplete, and—a more serious failing—there are errors in some of the examples, such as those for the TONES command. The errata sheet misses many of the errors in the reference manual. However, Dr. Logo does include a fine glossary of general computer terminology and a separate command summary.

Measuring up to the Family Name

The version of Logo developed by Seymour Papert at MIT for the Apple II is considered by many to be the standard against which other implementations can be measured, and Dr. Logo measures up

Dr. Logo Digital Research, Inc.

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reasonably well. It contains nearly all the features of the original MIT implementation.

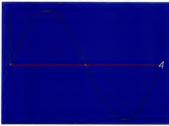
Dr. Logo's advanced features include good error handling, a help command, redefined primitives, packaging and burying procedures, property lists, extensive computational and arithmetic functions,

upper- and lower-case characters, improved screen resolution, comprehensive workspace management tools, and convenient debugging and tracing commands.

The PRINTSCREEN command dumps the graphics on the screen to an IBM Graphics Printer, while COPYON and COPYOFF send text to the printer. The



A dandelion created with the PEN, SETPEN, and SETPOS primitives.



A aine curve created with turtle graphics.

extensive arithmetic capabilities include ritgonometric and logarithmic functions and support for decimal numbers with up to 15 significant digits. Hoating-point numbers are internally stored in a standard chelif format with a range from 10 $^{-20}$ to 10^{-200} . Those who are mathematically inclined will appreciate the use of +INF or epresent positive or negative or infinity. Arisis will enjoy Dr. Logo's 16 background colors and two sets of three-color pathets for pen tracing.

One of Logo's exceptional features is that it permits you to extend the language with your own commands. You can package and hide procedures, which then behave like built-in functions or primi-

tives If something goes awry with your programming, Dr. Logo's debugging facilities are the perfect remedy, especially the TRACE and DEBUG commands, which allow you to monitor the actions of a particular program as each of its commands is executed. The workspace management commands are extensive. Suppose you wish to gauge the impact of a change in a given procedure. Dr. Logo offers the command POREF, which prints out the names of all the procedures that call the one you changed. The FOLLOW command permits you to rearrange the order of procedures in your workspace, and the POPRIM command displays all or selected definitions of Dr. Logo primitives. This help feature is handy if you have misplaced the command summary booklet that comes with the documentation

What Dr. Logo Lacks

An important capability missing from Dr. Logo is a command to change the aspect ratio of the display. On our monitor (a Princeton Graphics HX12), the relationship between the height and width of the creen causes circles to appear oval. Dr. Logo offers no easy way to correct this.

The maximum number of nodes available in Dr. Logo is about 10,000, or about 50,000 bytes of workspace. Though significantly greater than the number of



or artists, Dr. Logo provides 16 background colors and two sets of 3color palettes for tracing.

nodes available on some earlier versions, it is only about a third of the node space available with IBM Logo. Dr. Logo's implementation of the stack is also inferior to IBM Logo's. The stack, used by the interpreter to keep track of which program is currently running, can easily be overrun, which affects the number of times a recursive procedure can be called. A simple recursive countdown procedure could manage 514 recursions using Dr. Logo. But IBM Logo can run hundreds of thousands of recursions without problem, probably because of the sophistication of its interpreter. It is apparent that the Dr. Logo interpreter is not nearly as sophisticated in handling recursion as interpreters found in other Logo implementations.

What You Need

Dr. Logo requires the IBM Color Tephics Adapter, a color motion, and a minimum of 192R RAM. It operates on a dual display system, with a monochrome display and a printer adapter to display graphics. On the Compact, with its built-in display, the graphics are in various shades of green. Dr. Logo will not operate with a monochrome display in the color monitor of corpact with a monochrome display. The color monitor of the color model of the color model of the color adapter.

Dr. Logo runs under the CP/M-86 operating system, not under PC-DOS. It self-boots from the limited copy of CP/M-86 included on the program disk, so you don't need to purchase the full CP/

M-86 operating system (see "PC News," PC, Volume 3 Number 5). The 192K requirement means that Dr. Logo will not operate on the PC/r. Digital Research, however, is planning to overcome this limitation by releasing a version that runs with 128K RAM.

Just What the Dr. Ordered? We have mixed feelings about Dr.

Logo. It appears to be a good generalpurpose language, but the appearance is deceiving. Dr. Logo has the look of a language written by and for experienced programmers: it offers the immediate use of an 80-character screen for text, standard use of lower-case characters, the ability to direct output simultaneously to the screen and a printer, and, most significant, extensive debugging facilities. Nearly all of these features are missing from other versions of Logo. On the other hand, Dr. Logo is missing features that are fundamental to serious programming. The most critical omissions are a way to read and write data files and a facility for interacting with the operating system or interfacing machine-language routines. These limitations diminish the value of Dr. Logo as a general-purpose language. We got the impression that Dr. Logo

was rushed to market before it was finished. The general approach of the implementation is excellent and would certainly make Dr. Logo the choice of many serious users if it had the necessary functionality. We hope that Digital Research will apply strong medicine to its product.

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The flourishing Logo market is not the only focus of the IBM Logo and PC Logo competition. The main goal is to capture the position of the premier computer language.

s it the best of Logo? Is it the worst of Logo? At first glance, the contest between PC Logo from Harvard Associates and IBM Logo seems no more than a battle between two turtles.

Logo, however, is more than mere turtle tracks. It is a newcomer to the IBM Personal Computer, no IBM-compatible version of the language is even a year old. This language was designed in the early seventies primarily as a classroom tool, but the warring in the weeds documented here is only an elimination round. The winner is destined to carry the Logo banner into what may be the biggest battle of all, Logo versus BASIC as the premier personal computer language (see the accompanying sidebar, "BASIC Survival and the Logo Challenge"). Judging from the initial skirmishing, the victory may be an unprecedented upset.





A Look at the Books

The first look you get at any program is the book that tells you all the wonderful things you can do and how to do them. Both PC Logo and IBM Logo come with exemplary manuals. The IBM version comes in a standard IBM binder in a vellow bright enough to make sunglasses a useful option. PC Logo is bound in a slightly larger, gray vinyl, looseleaf book. Although the contents of each manual are, by necessity, similar, the two differ tremendously in style and arrangement. There's no clear winner; each compendi-

If you've never encountered a turtle before, PC Logo should be your first choice. More than half of its manual is a turtle tutorial that effectively introduces Logo's syntax. Although it is written at a level appropriate for school children up to

about ninth grade, no adult should be put off by it.

The PC Logo tutorial is hardly faultless, however. Perhaps the most objectionable part is-would you believe-the typesetting! And I'm not picking nitsthe type-them-in-yourself program listings are shown in boldface, presumably to distinguish them from the rest of the text. But the boldfaced typesetting resembles Presstype (or other dry transfer lettering) applied by someone with the shakes. Its coarseness makes discerning spaces between words a job for eagles, not human beings. In any other language such a problem would be a small point, but in Logo spaces are extremely important. The IBM Logo manual does not advance the art of typography, but it does make spaces between words unambiguous.

The IBM manual's tutorial on the lan-

PC Logo Version 2.0 Harvard Associates, Inc. 260 Beacon St.

Somerville, MA 02143 (617) 492-0660 List Price: \$149.95

Requires: 64K RAM, one disk drive:

color/graphics card optional. CIRCLE 734 ON READIR SERVICE CARD

IBM Logo IBM Corporation

Systems Products Division P.O. Box 1328 Boca Raton, FL 33432 (800) 447-4700

List Price: \$175

Requires: 128K RAM, one disk drive: color/graphics card optional. CIRCLE 735 ON READER SERVICE CARD

PC MAGAZINE . MAY 15, 1984

um has its strengths

guage's features is useful, but brief compared to the PC Logo lessons. To help younger learners, IBM includes a spiralbound booklet, Logo: Programming with I's name implies, a totofal on turtle graphics. It does an excellent job of covering drawing, file usage, and screen modes, but, indformately, it does not begin to tap the full power of Logo in list processing (tex) or mathematics.

strength of the manual alone. I tested both implementations hands-on. IBM Logo and PC Logo (version 2.0) will run on any IBM Personal Computer, including the PG/r. IBM's implementation requires 128K of random-access memory; PC Logo requires halfs a much. Both benefit from extra memory—IBM Logo cam make use of up to 256K bytes of RAM; its competitor can use 192K bytes. Both Logo come on disk, and neither is copy

allows any number of columns of characters less than or equal to 80. If more than 40 characters per line are desired, the skinny 80-column character set is used for displays; the wider character set is reserved for displays 40 columns wide or less.

Doing the (Screen) Splits

An interesting difference between the two dialects is the way they handle splitscreen displays in which the bulk of the

formatting are areas of real difference between the products of IBM and Harvard Associates. PC Logo has seven different screen modes; IBM Logo has one graphics mode.

Where the IBM Logo documentation shines is in its reference section. In style it's similar to the IBM BASIC manual, featuring both an in-depth explanation of primitives (commands) and a profusion of examples for every occasion. The bulk of it is arranged by the name of the primitive, and it's quick and easy to use.

PC Logo prefers to arrange is reference section on primitives by function. To zero in on a specific primitive, you must first visit the index, then go hunting through its references—likely several of them—before you find what you want. For casual reading to get an overview of what makes Logo work, the PC Logo manual makes sense, but for quick checks while programming, the IBM manual is easier and faster to use.

Logo versus Logo

No language gains preeminence on the

protected. An extra utilities disk supplied with PC Logo carries demonstration programs that can be studied to learn about the language. IBM Logo, on the other hand, includes on its single disks a file of "tools," which are actually more like utilities—short programs to add features not built into the language itself.

built into the language itself.

Screen mode and formatting are areas of measurable difference between the products of IBM and Harward Associates. PC Logo has seven different screen modes manched to the IBM PC's capabilities—40-column text in color and monochrome, and the product of IBM and the product of the product of

screen is devoted to turtle graphics and only the lower left given over to text. In IBM Logo, the whole screen remains an active area for the turtle—it can actually draw over text. Pressing one button or typing "full-accreen" blasts away all the text and leaves the turtle and its drawings unscathed, alone on the screen.

The Capp's text is not willing section. In PC Capp's text is not willing the power of the display is off limits to the portion of the display is off limits to the until. Furthermore, if you shift from full-screen graphics from the lower part of the screen are irrevocably enased—when you flip back to full-screen mode (by pressing a function key), the bottom of the screen becomes empty and available for drawing again. I also discovered that flipping between display modes makes the turtle lose its place—the turtle becomes might like and hope all over the place, and the place when the place is the place—the turtle becomes might like and hope all over the place, and the place is the place—the turtle becomes might like and hope all over the place, and the place is the place—the turtle becomes might:

Logo has the potential to displace BASIC from its niche as the dominant micro computer language. In the emerging competition, only the fittest will survive.

B ASIC's dominance of the field of microcomputing is less secure now than at any time in its 20-year history, and the reason is the appearance of ser-call highly successful implementations of Logo for the IBM PC. The mature state of microcomputing and the intrinsic advantages of the Logo language will very possibly continuite to diminish permanently BASIC's preeminent position. A look at Logo's past explains without

Whatever their differences, most Log disches when the same rook of the same rook in MIT a unfricial-intelligence laboratory, where the original Logo language was where the original Logo language was developed by Seymour Paper as part of a project to num the personal computer into a revolutionary educational rook. A contraderation of the contraderation of the results of the personal computer work work was the turtle microworld—what we call "untel papinse"—which allow children to learn advanced geometric concepts by exploring and internelling with their ideas as never before possible—on a computer display.

In Logo's infant years, turtle graphics proved so captivating that educators and programmers alike failed to explore the rest of Papert's ideas. But Papert's project has a scale that reaches far beyond the turtle; it involves an almost unlimited number of educational microworlds. Logo's real place in Papert's work is to make designing and working in these new microworlds can in these new microworlds can be a microworld to the properties of the properties of

A microworld is nothing more than elaborate software, just as all other computer programs are software. If Logo makes microworlds easy to manage, it should do the same for everyday programming, and in fact, it does. Because both PC Logo and IBM Logo embody Paper's underlying philosophy, they

reach beyond turtle graphics to become true general-purpose computer languages as capable as either BASIC or Pascal (or nearly any other language).

Log's greatest strength is its case of learning, which makes it the language of their choice for new computer owners. Also, Logo's case of learning has given the language an image problem, attributable in part to the popular belief that the more powerful a programming language is, the more difficult it must be to learn and use. Following this specious notion, programmers assume that because Logo is or much fun, it cannot be considered

scriously as a programming language. Logo's programming abilities have not been compromised by its simplicity of learning or use. The reason has to do with the way the language was conceived. From the perspective of user convenience, most computer language was convenience, most computer language began with an analysis of the problems to be solved and soogly the easiest way to solve the problems to the solved and sought the easiest way to solve the problems to the solved and sought the easiest way to solve the problems to the solved and sought their tasks and the beings work frongs their tasks and the created the cassest means possible for them to do so.

Logo versus BASIC

The original philosophy behind BA-SIC was far from the Logo ideal. BASIC squeezes as much power as possible into as little memory as possible. Such a goal is understandable—when BASIC was originally written, computer memory was expensive.

The need to conform BASIC to the limited hardware of the time had unfortunate results. Pioneering hobbyists had to put up with the unintelligible and

unyielding demands of a radimentary language to get their microcomputers to do anything at all. When the first generation of personal-computer engineers who grew up with primitive hotby machines and the quirks and demands of BASIC decided to add more power to their computers, it was only natural for their to add more functions to their damiliar, if antiquated, language rather than alter its structure—despite that that after that structured changes would have made computing more tractable.

!!

In contrast to BASIC, Logo began life with the optimistic thought that computers will continue to become increasingly powerful and that their increased power could be tapped to make programming languages easier to use and understand—so easy, in fact, that turtle graphies can be used by preschool children.

Papert did not design Logo with the constraints of a tiny microprocessor in mind. He believed that a good computer language for children must be a good computer language—period. He based Logo on another language called LISP, used primarily in artificial-intelligence research on mainframe computers. Logo simplifies LISP's syntax without compromising its power.

A battle between Logo and BASIC may be shaping up, and IBM PCS and may be shaping up, and IBM PCS and just fire the first shote. Papert believes that IBM machines are the first compute espowerful enough to combine case of use and sufficient computing power to take Logo out of the school-troom and put it to work in the business work it to work in the business work logo, will be instrumental in establishing the language in the real world of serious proparaming.—W.J.R. resulting graphics can take strange turns. In BASIC, you can make your writing

In BASIC, you can make your writing more colorful—licitally—by chilerally—by mode. Ft Logo, however, deem't even antics. You can have your test any what you warn, as long as it's white on black. You can try using the SETBG—or SET, be and the set of the se

Your artistic nature will not find com- to increase calculating speed up to 50

plete satisfaction with IBM Logo either. With its SETTC for set text color) command, you can set both a foreground (character) and background color in text mode. But the boder trenains obstinately black no matter what you try to do. The SETBG command changes both background and border to the same color in graphics mode. These minor but bother-some omissions may be the subject of future revisions.

Mathegraphics

The two Logos obviously handle their mathematics functions differently. PC Logo boasts that it can take advantage of the legendary 8087 math coprocessor chip

times. Not having an 8087, I can't vouch for the truth of this claim. But I can assert that as far as math is concerned, PC Logo belongs in the slow track. You get two decimal places and a grand total of six digits of precision. That means, of course, that 1/9 equals exactly 0.11 and 1/7 equals exactly 0.14. PC Logo can tackle scientific notation, but again you face the six digit, two decimal place limit.

Math is one area where IBM Logo takes the language a giant step bound BASIC. Far from being limited to just single or double-percision arithmetic, percision arithmetic, some up to 10,000 significant digits on—up to 1,000 significant digits on with 15 ack for the sum of 19 minutes, with 15 ack for the square toot of 19 with that precision setting, and you could amount take a short vacation (eventually, in, say, about 10 minutes, the answer appears).

The difference in handling numbers pops up prominently in, of all things, turtle graphics. The IBM version of the language appears to be better wedded to the machine, since PC Logo's rounding errors result in some imprecise drawings. The problem became apparent with a simple test program I wrote-the turtle draws a hexagon, turns 10 degrees, then draws another, ad infinitum. In theory, after the 36th repetition, the turtle should begin tracing over tracks it has already drawnat least that's what happens with IBM Logo. But the PC Logo turtle missed its tracks by a slight fraction and kept going around. As the turtle tried to retrace its steps, the lines of the figure became broader and broader until the sharp weblike pattem had turned into a shapeless blob on the screen.

Another difference that may be related to the 8087 coprocessor is the speed at which the turtle races through its drawings. In theory, the 8087 should make PC Logo's graphics faster than IBM's. Without the coprocessor, however, the PC Logo trule loses the race.

A Word from the Founder

The originator of Logo is impressed by IBM Logo's strong family resemblance to other commercial versions of the language.

No to discredit the worth of my own Logo evaluation, I did seek out a higher authority for his views. The authority most qualified to evaluate Logo is Seymour Papert, who created the language and formaliated the educational philosophy it suppors. While interviewing Dr. Papert for PC's sistential philosophy it suppors. While interviewing Dr. Papert for PC's sistential philosophy. Papert for PC's is poper publication, PC'y. Magazine, 1 poper the question: "Which dialect of Logo is best?"

At first he was reluctant to say. Each has its place, he believes, and together all versions of Logo will help bring a new computer literacy and even greater understanding and knowledge to the world.

He did recognize the unique advantage of one version: IBM Logo. Surprisingly, the edge he sees for IBM Logo is not its official moniker or Big Blue backer. What impresses Papert is that its creator, Logo Computer Systems, Inc., or LCSI, also authored Apple Logo, Texas Instruments' Logo, SmartLogo for the Coleco Adam, Atari Logo, Logo for the DEC Professional 350, and (scon-to-beavailable) Macintosh Logo. IBM Logo's strong family resembance with all these other Logos makes it (and its siblings) the closest thing available to a universal version of the language.

Harvard Associates believes its language plays the same role in relation to official IBM Logo as Terrapin Logo plays to the official Apple version of the language-as a more workable classroom alternative. The relationship is natural for the firm to assume since many of their members once worked for Terrapin and formed their own company when they realized that the need for a Logo for IBM computers was not being met by Terrapin. But the use of PC Logo will have to spread far beyond the classroom for it to challenge the LCSI family of Logos' headstart on creating a Logo lingua franca.-W.L.R.

Friendly Prompts

One of Logo's greatest strengths can be described by that oft-misapplied phrase, "user friendliness." The language is easy to use. And it can be genuinely friendly. IBM Logo even answers you in the first person when it has a problem. If you ask IBM Logo to do something outside of its vocabulary, it answers politely, "I Don't Know How To Scrooch" or whatever you've asked it to do. If you get frustrated and type in an obscenity. you may be delighted with the response. PC Logo, on the other hand, avoids unseemly familiarity, maintaining a staunchly machinelike manner. "Scrooch Is Not a Logo Pro-

cedure", it will inform you. Like BASIC, Logo wants a print command before it will output results to the screen. But at least it doesn't consign your answer to oblivion if you forget to preface your questions properly. If you forget the PRINT or PR in PC Logo, the program will answer, "Result:". IBM Logo is both friendlier and more confusing, it answers: "I Don't Know What to Do With . . . "

PC Logo is not sensitive to upper- and lower-case letters. The commands FOR-WARD, forward, and even ForWArD are all equally intelligible. When you start, the program initially defaults to all caps whenyou type alphabetic keys. Pressing the Shift key brings up lower-case, and pressing Caps Lock reverses the default and permits you to set things typewriterlike.

IBM Logo cares about case. Type in "fd" instead of "FD" and Logo will answer "I DON'T KNOW HOW TO fd." At turn on, the program defaults to all caps and only lets you type lower-case while you hold down the Shift key (Caps Lock does absolutely nothing). Although this arrangement helps protect you from making a mistake in case, it also makes typing screens of text inconvenient.

Files, Ports, and Packages

PC Logo seems to have an edge when it comes to reading disks. You can tell the program to load a file, and in seconds,

your program is read from the disk, loaded into memory and ready to go. Every time PC Logo finds a procedure in a disk file, it

assures you that it has been read into memory by echoing to the screen that the procedure has been defined. IBM Logo spends a much longer period alternately spinning the drive, turning it off, and spinning it again. It takes quite a while to load a moderately long file, say 8,000 bytes, for a moment, you may find yourself retyping your work.

An area where IBM Logo shines and PC Logo barely flickers is the packaging of procedures. A package lets you link several procedures together so that they can be loaded and saved to disk merely by using a single package name. It's a con-

n area where IBM Logo outshines PC Logo is the packaging of procedures.

but the program does nothing to assure you that all is well. The only sign that the program has finally loaded and that the disk drive didn't just finally die is the return of the question mark (?) prompt to the screen.

PC Logo is in some ways an assembly language programmer's dream. You can get at every byte in memory and every port in the machine with simple instructions. IBM Logo has fewer assembly language primitives, but includes .DEPOSIT and EXAMINE (roughly equivalent to BA-

SIC's POKE and PEEK). Both Logos have good editors. PC Logo has an especially welcome search and replace function, which can race through multiple procedures and change the name of a variable (or primitive) throughout a file with a minimum of keystrokes. But the PC Logo editor does have one unnerving function (one you'll probably get used to)-it redefines the Del key to mean "remove everything on the line to the right of the cursor." If you forget that

venient feature when your program has two or three dozen procedures in it, which is not uncommon in Logoland. PC Logo lets you add procedures to files and save the entire workspace but does not otherwise package procedures together.

IBM Logo also handles property lists. which let you assign a quality or property to individual elements of a list. (Lists are to Logo as arrays are to BASIC, but, because they do not have to be dimensioned, lists are easier to use.) Among other functions, property lists can build writing programs that "learn" and simplify the creation of specialized databases.

Dribble files, another feature of IBM Logo not present in PC Logo, can aid in educational applications. A dribble file is a play-by-play record of every command that is given Logo, which a teacher can search through at his or her leisure to see what the child has been up to.

IBM Logo NODES command lets you see how much workspace (memory) you have left, whereas PC Logo keeps you in

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TWO LOGOS

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Living with the Logos

In one respect, the gap between the Logo dialects is extremely wide. IBM Logo and PC Logo are incompatible. Only the very simplest programs written with one can run on the other. The irreconcilable difference is vocabulary. A few primitives (commands) have slightly different names in the different dialects. Some primitives are not shared, and a program will not run under a given Logo if it contains unfamiliar primitives.

Because the underlying structure of both dialects is so similar and files are reasonably close to standard ASCII, translating programs between the two dialects is not too difficult-although it can become tedious (PC Logo's editor with a search and replace operation can make the translation easier). Primitives that are different or nonexistent in the Logo you are translating a program to can simply be defined as procedures.

For the most part, turtle graphics primitives are exactly the same, so either dialect may work well with most introductory books about Logo, particularly those written for children. Both PC Logo and IBM Logo are suitable for classroom workbut Harvard Associates has given its language a unique advantage, a special lowcost multiple-user license for PC Logo in educational applications. By paying a modest fee an entire classroom can use and make copies of the program without copyright infringement. Harvard Associates will also sell its program's documentation separately.

Either Logo can handle difficult text manipulation, though IBM Logo's more precise mathematical and property list abilities make it the choice for scientific or business applications. Allowing for the admitted limitations of both Logo dialects. you'll probably find that you can do anything with either of these Logos that you can do in BASIC. I won't say better, because "better," like beauty, is in the eves of the beholder.



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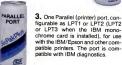
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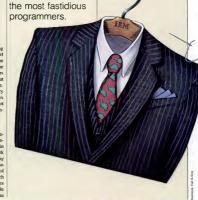
Like fine clothing, IBM Logo has been tailored for many SPECIAL REPORT JANE & HAL LAMSTER tion belongs in the wardrobe of even

uses, from casual to formal. This well-

f you want the equivalent of buying Brooks Brothers, you'll want IBM Logo. It costs a little more than the competition, but think of the label and the quality behind the name. IBM Logo offers all the features of the Logo developed at MIT by Seymour Papert, and then some. Because of the PC's substantial memory capacity, it can handle large and complex programs and offers features that were not available in earlier versions of the language.

A Private Tutor

In good IBM fashion, the documentation is clear, easy to read, and well organized. First-time users will feel they are in the care of a first-rate tutor as they work through the tutorial, Logo: Programming with Turtle Graphics. Its numerous inserts, or "Bug Boxes," are indicative of the attention lavished on beginners; each describes a common problem that novices are likely to encounter, gives the possible reasons for it, and outlines the appropriate



corrective action.

For the more ambitious user, the reference manual contains a chapter entitled "Developing a Logo Project." The project in question is an interactive program of arithmetic "story" problems of the type: "Mimi had 10 cakes. She bought 5. How many did she have then?" The user types in the answer, and the program responds with an appropriate comment, such as "Right" or "Try again."

The chapter nicely illustrates Logo's approach to problem solving-breaking complex problems down into simpler elements and then reassembling the answers to the most fundamental questions into a solution to the whole. The first step, for instance, is to identify the project's three subgoals, such as creating a subprogram for generating the stories. Each subgoal is then itself analyzed in a similar way.

IBM Logo's fine documentation is complemented by the high quality of the language's implementation. The turtle graphics are superb. IBM Logo offers 16 background colors and has 2 palettes, each of which contains 3 colors for pen tracing. The graphics screen image can be dumped to an IBM Graphics Printer. In case the aspect ratio of your display causes screen images to distort, the .SETSCRUNCH command will make the proper adjustment to set things right.

Dribbling on Screen '

Even novice users will be able to develop their own simple programs almost immediately. And if they make mistakes, IBM Logo's straightforward error mes-

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sages will help put them back on target. If confusion occurs over a message such as "Can't Dribble on Screen" because a user doesn't remember how a language can dribble, let alone do so on screen, then the user can always look up the explanation in the reference manual. (For the meaning of dribble, see "A Tale of Two Logos" in this issue)

Beginners with limited equipment will find that IBM Logo works with a blackand-white monitor or color TV using the IBM color monitor display adapter. But running the language on an IBM monochrome display flips the turtle on its back, so to speak, and eliminates turtle graphics. We were able to run IBM Logo on the Compaq and the Columbia Data Products MPC with a color adapter and color monitor. New and experienced users may want to take advantage of the possibility of using a dual monochrome and color setup.

For Experienced Programmers

Does IBM Logo have anything to recommend it to experienced programmers? All programmers would love to be able to customize the language they are working with, and IBM Logo makes this possible with procedure packaging and burying commands. This capability is extended by extensive facilities for interacting with the entire system at the level of bytes of memory, including the so-called dot (.) commands that function like PEEK and POKE in BASIC. IBM Logo can actually load, save, and call assembly language routines. The reference manual provides detailed information on the underlying system, including memory maps, for the benefit of the experienced user.

Other advanced features include automatic program execution at startup, property lists, extensive computational facilities and arithmetic functions, control over arithmetic precision and formatting, upper- and lower-case text, and comprehensive file and device handling. The file TOOLS.LF on the Logo Language Diskette contains a tool kit of procedures that make programming easier. The most important of these are the debugging procedures. Others, such as the syntax for creating comment lines in program state ments, are valuable, if not essential, aids,

Computer sophisticates will be especially grateful for IBM Logo's file-handling capabilities. The functions for reading and writing data files permit the use of random-access files by specifying the starting byte from which to begin reading or writing. This feature is one that makes this implementation of Logo suitable as a true general-purpose programming language.

This status is fortified by the greater amount of usable memory in the IBM Logo workspace. On an XT configured with 512K RAM, the numbers of nodes available-at 5 bytes per node-is about 30,000. Moreover, the internal stack and recursion algorithms appear to be extremely efficient. We were hard pressed to develop even a test program that ran out of

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offers a "play" command and full ladybug (aka turtle)

graphics.



ke many PC owners with young children, David Smith of Dan-bury, Connecticut, was excited about the educational potential of the computer language Logo and wished the could find a version to run on his computer. But unlike the rest of us, he went beyond wishing. About a year ago, before any commercial implementations for the PC were even on the horizon. Smith decided we write his own Logo so that his three children could "do something more creative with the computer than shoot down aliens."

SPECIAL REPORT DARA PEARLMAN The result is Ladybug, a pared-down version of Logo that includes most of the "turtle graphics" commands, a text editor for composing Logo procedures, some mathematical functions and a series of music commands that control the PC's sreeker.

Ladybug isn't in the same class as the full-fledged versions of Logo now on the market, such as Dr. Logo from Digital Research, the. It lacks many Logo capabilities, most notably list processing, the ability to manipulate sentences that allow Logo users to create 'computer poetry' and write programs that include clements or artificial intelligence. And the version I reviewed still has a few not very ladylike bugs lurking here and there.

bugs lurking here and there.

All the same, you can't beat the price.
Following the lead of "freeware" pioneer
Andrew Fluegelman, who wrote the popular communications program PC-Talk,
"Smith is offering Ladybug for free. If
you want a copy, just send him a blank,

adybug would be useful at the elementary school level where Logo classes focus on turtle graphics.

formatted disk with a prepaid mailer (see the accompanying sidebar, "How to Get a Ladybug"). He!! Loopy the program and the text of a 51-page manual onto your disk and return it to you. You're free to make copies for your friends. If you like Ladybug, Smith is happy to receive concrete expressions of appreciation, preferably \$35.

Ladybug isn't Smith's first foray into the freeware-style market place. He's also the author of a full-screen text editor called FRED (for Free Editor) available on many PC bulletin boards and in the CompuServe IBM PC Special Interest Group (SIG)

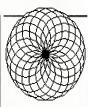


Figure 1: An example of Ladybug graphics.

library. If you send him a formatted diskette and a prepaid mailer, Smith will copy FRED onto your disk along with the necessary instructions.

In either case, there's no obligation to sord money. In fact, Smith emphatically doesn't want to receive any checks along with requests for his programs. He's not selling, he insists, because that would cratial sales tax and other complications. Each time you run it, Ladybug displays a friendly reminder that the author would appreciate a contribution. If you choose to ignore it, that's between you and your conscience. No lawyer will call.

If you're an educator, Smith doesn't even want your conscience to bother you. He relates that he recently received a letter from three teachers who apologized for not sending money, explaining that their software budget for the year was only \$100. However, they continued, they would send the \$35 after the school candy sale.

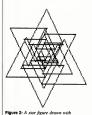
Smith nixed that, After all, the money he makes from Ladybug helps support his computer hobby, not his grocery bills. He makes his living writing computer programs for a large corporation and doesn't wish to divert money from good causes like education. He emphatically doesn't want to take any money from school cardy sales. So if you use Ladybug in the

classroom, Smith doesn't want you to pay for it.

Ladybug's Fans

Perhaps you're wondering whether teachers would find much use for a limited version of Logo that concentrates mainly on graphics. Bobby Goodson, computer resource teacher for the Cupertino Union School District in California's San Francisco Bay area, thought that Ladybug would be very useful at the elementary school level where Logo classes concentrate on turtle graphics. But, she added, in junior high and high school classes, Ladybug's lack of list-processing abilities would be a significant drawback. Since few elementary schools buy IBM PCs, she thought Ladybug might make its biggest impact on young children whose parents own PCs

Has Ladybug developed much of an audience outside of formal educational circles? Last September, at the urging of enthusiastic friends, Smith posted a notice on CompuServe that he would give away copies of Ladybug to anyone who sent him a diskette and a mailer. The response surprised him. In the first 4 months, he received some 150 requests for the pro-



Ladybug graphics.

gram—many from bullein board operators and chie birarians, indicating that the program is reaching an even wider audinoce. The fact that Ladybug is still unfinished (vension 0.9) and has some acknowledged bugs doesn's seem to have made a difference. Smith encourages people with questions or problems to write to him via the U.S. Mail via Compuserve EMAIL cover number 734-55, 153. From users over the control of the control of the is "surprisingly robust," with few undiscovered buss.

Ladybug is an introduction to Logo that concentrates on Logo's famous turtle graphics—in this case renamed "ladybug graphics." In many of its details, Ladybug follows the Terapin Logo for the Apple Computer. As a tutorial text, Smith recommends Logo for the Apple II by Harold Abelson (Byte/McGraw Hill, 1982, softcover, 227 pages, \$15.95).

A Geometric Ladybug

When you start up the programs, you'll see a triangle in the center of the screen. That's the ladybug. At the bottom of the screen is a question mark prompt, waiting for your command. You can move the ladybug around the screen with commands like "forward 50" or "right 90". The units for forward and backward motion are called "ladybug steps." The distribution graphics screen is 500 ladybug steps wide and 300 steps high are degrees. Thus, to reverse the direction of the ladybug, you tpe in "right 180".

The ladybug draws as she moves, unless you tell her to pick up her pen ("penup"). When you want her to resume drawing, you give her the "pendown" command.

Using Ladybug's text editor (a version of FRED), you can combine these commands into "procedures" that create intricate designs, such as the examples in Figure 1 and Figure 2. Seymour Papert, the inventor of Logo, contends that a child can get an intuitive feel for geometry and high-rmathematics by experimenting with the

an introduction to Logo that focuses on turtle graphics, in this case called ladybug graphics.



turtle commands and learning how to create such designs.

Suppose you want to write a procedure to draw a triangle. You type the words to draw a triangle. You type the words "celit triangle" after the question mark prompt, In a flash, the screen high, the screen you lise screen, you'll see the beginning of purpocedure, consisting of two lines: "Fo triangle", and "red". You then red". You then the keys let you do simple edding, such as deleting the current line, and the cursor control keys let you move the cursor anywhere on the screen, Figure 3 shows you the complex "triangle" procedure.

When you're satisfied with your procedure, you press F9; suddenly the editing screen is gone and the ladybug reappears. Now the procedure is part of Ladybug's repertoire, just as if it were a primitive command. Type in "triangle" and the ladybug will draw one.

If you've had experience with Logo turtle graphics, all of this should be familiar. Like Logo, Ladybug lets you use variables in your procedures and lets a procedure call itself, a process called "recursion." With these tools you can vary the sizes and angles of your shapes to create graceful spirals and sunbursts.

To help get you started creating your own designs, the Ladybug disk includes a library of ladybug procedures from a number of sources, including some of the procedures in Abelson's book. You should be able to draw your own ladybug pictures with very little practice.

In addition to repeating basic turtle graphics, Smith has added some elegant touches of his own. If you have an IBM monochrome montor in addition to a color monitor, the text editor will work on the monochrome dispay, leaving your graphes undisturbed. If one of your procedures word work, you can turn on a trace by pressing F9. The trace puts the ladybug time slow motion, displaying each command before the ladybug coccutes it. The motion was the ladybug towards the situation. To go on to the next command, you study the situation. To go on to the next command, you press any key; to turn off the trace, press F9 again.

To triangle: right 120 forward 100 right 120 forward 100 right 120 forward 100 end

This procedure also draws a triangle, using the 'repeat' command.

To triangle repeat 3 [right 120 forward 100] end

Figure 3: A Ladybug procedure for drawing a triangle.

nother nifty
feature of Ladybug
is its ability to
play music with its
"play" primitive.



Ladybug Music

Another nilty feature of Ladybug is as shilty to make music. Since Smith wrote Ladybug using compiled BASIC, he docided to create Ladybug's "play" command, which is identical to the corresponding command in BASIC. "Ladybug just hands the string to BASIC and says. Here BASIC, play that, " Smith explains. He added this feature because it was easy to do and because he thought users might endy oceaning musics and perturbations. He was a service of the controlleds some sample Ladybug music. My favorite is a version of "I've Ben Working on the Railroad."

In version 1.0, Smith plans to include a command called "tone" based on BASIC's SOUND statement, which will allow students to experiment with tones of different durations and pitches. Using pro-

gram variables to change both elements, students will be able to explore the properties of music just as they explore the properties of geometric shapes with ladybug graphics.

If you want to stop your work and pick up again later, Ladybug lets you save your "workspace" to disk. The workspace includes all of the procedures you created during one work session, and the save command saves the entire workspace under one name with the extension "BUG." The next time you run Ladybug, you can read your old procedures and continue working.

If you want to save only part of the workspace, Ladybug includes some workspace management commands that let you erase a procedure or clear the entire workspace. You can also check the disk directory with a catalog command and delete

files from the disk. Unfortunately, version 0.9 lacks a command to list the process, so if you are aworking on a complex program without proceedings and proceedings, you can sometimes lose your way. If that does happen, though, you can save the workspace to disk and then examine the file when the proceedings are the proceedings and the proceedings are the proceedings. If the proceedings are the proceedings are the proceedings in the file.

In common with most programming anguages, Ladyug includes program control commands such as "if-then-else" sequences and statements assigning values to variables. It can also perform simple arithmetic and such advanced functions as aguare roots. And it lets you pass values between procedures with an "output" statement, although in version 0.9 this feature was not in good working order ure was not in good working order.

Ladybug Bugs

Version 0.0 has a few other troublesome bugs. For example, the "request" command, which reads input from the keyboard, refuses to accept alphabetic characters. Its insistence on numbers only makes it impossible to create word games with Ladybug. Also, the text defor dish't work properly when I tried to create a procedure with its name written all in cares.

These are minor irritants, however, and Smith promises to fix the problems in version 1.0. He will also make the program more compatible with IBM Logo.

Will Ladybug continue to grow after version 1.07 Smith doesn't think so. He points out that most implementations of Logo are written in LISP, the list-processing language that reigns as the favorite researchers in artificial intelligence. Ladybug, on the other hand, Is written in compiled BASIC, and Smith thinks he's taken Ladybug as fare as BASIC will be thim go.

Smith doesn't expect Ladybug to compete with commercial versions of Logo. He predicts only that Ladybug will whet people's appetites for the real thing.

How to Get a Ladybug

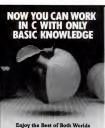
"Send no money" sounds like a come-on, but David Smith is absolutely sincere. For your free Ladybug, read on.

Send a formatted double-sided diskette and a postage paid mailer to:

David N. Smith 44 Ole Musket Lane Danbury, CT 06810

David Smith asks that you write
"LADYBUG" on the outside of your
envelope. He also requests that you send
73145, 153.

no money. And please don't call. His wife works evenings during some weeks and sleeps during the day. If you also wish the text editor FRED, please send an additional diskete. Ladybug takes up most of a double-sided DOS 1.1 disk-ette. You can send questions to David Smith at his Dambury address or via CompuServe EMail at user number 174445. 183.



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rograms to help you draw pictures, charts, and diagrams on your PC are plentiful. They are available at a variety of prices, and they range in sophistication from recreational or educational drawing programs to business graphics packages to powerful industrial systems

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List Price: \$1,200. Auto Dimensioning module, \$250; Data Base Extraction Module, \$350.

Requires: 320K RAM, two doublesided disk drives, IBM Color/Graphics card, printer or plotter.

erly scaled and accurate for production CIRCLE 703 ON READER SERVICE CARD work. CAD programs must be able to dis-

tives.

falls into a category called computerassisted design (CAD). CAD systems can create and change line drawings used in construction, manufacturing, and engineering design. They can retrieve symbols and drawings from memory, automatically enhance the accuracy of drawings being created, perform modifications through simple commands, and display drawings in many different levels and perspec-

Professionals use them to create blueprints, schematic diagrams, elevation drawings, and multilayer design drawings. CAD programs help them draw lines and standard geometric shapes, recall shapes stored in special files, change previously stored drawings, and file revised drawings to be used again. CAD systems have special features that give great precision to drawings so they are always propplay various aspects, dimensions, and levels of a drawing so that the draftsman can illustrate different features and systems individually.

CADplan, a new entry into the CAD software market, is a valuable program for architects, engineers, and anyone else who wants to create and modify detailed drawings.

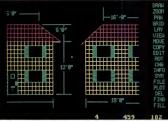
CADplan in Action

Imagine a home improvements contractor who has to create a preliminary design for a new home addition and submit a bid to win the construction job. The contractor wants to spend the minimum practical amount of time designing the addition, but the accuracy of his cost projections can make the difference between running a successful business and facing eventual bankruptcy.

If our contractor is equipped with a PC and CADplan, the first step he will take in



CADplan makes it easy for architects, engineers, and contractors to create detailed house plane such as this one.



CADplen's optional Auto Dimensioning module in action, it automatically measures the distance between any two points you designate and draws the line.

preparing a bid is to review previous projects to see if anything similar is on file. A major advantage of a CAD system is its ability to pull drawings that you previously created from disk files and allow you to modify them without harming or misfiling the original.

CADplan's initial screen includes a menu of 18 commands. Subcommands associated with these first level commands control the system. Each command is described in a help file that you call onto the screen by pressing the question mark key. You can use a mouse, graphics tablet, or the arrow keys on the PC keyboard to select the File command from the menu. The Dis subcommand displays a directory of perviously stored drawings. Unfortunately, the screen displays only the names of files without annotation, but if you are familiar with the files or keep notes on paper, then loading the data from a previous drawing is an easy job.

some tustwing is an ites by the contractor is bidding on a 14-by-16-for room addition with a closet, buy window, and hip proof (a roof with sloping ends and sloping sides). He has in his file proviously created with a hip roof, but it has an we have a side and the side of the but it has a web that a window in the same place he wants to put a hay window. He calls the existing drawing into working memory so that he can modify it.

The contractor expands the drawing of the room from 12-by-12 to 14-by-16 with the CADplan Edit command. It is easy to make such changes in drawings, but the procedures differ for various kinds of rectangles, triangles, circles, and lines. This is one of the few places where the program can get in the way of the job instead of helping. Before you can edit a drawing, you have to figure out what CADplan techniques you used to construct the original. You can use the trial-and-error method to determine how to edit a specific drawing, but it is probably better to develop consistent techniques and stick with them. For example, always use line segments to draw walls instead of using a

computer-generated rectangle. The walls in the drawing that is to be modified can be changed with a technique called "unbebradning." The ability to rubberhand lines and figures makes CAD-plan simple to use and forgiving. More or circle, you can literally pull and rectified in the control of the control of

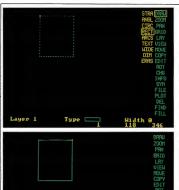
banding gives CADplan a major advantage over paper and pencil line drawing. It gives you control over the process and allows you to accurately position and dimension figures. This degree of control is missing from simpler programs.

The Lavered Look As our contractor edits the existing

drawings, he makes several significant changes. The original drawings showed plumbing for the wet bar and sink. Because CADplan works like a set of standard blueprints, the diagrams for the plumbing are drawn on a separate layer of the electronic drawing just as they would be on a separate sheet of the blueline drawing. Separate layers would be used for the exterior walls, plumbing, electrical wiring, lighting, foundation, elevation, furniture placement, interior detail, and other building features. Each separate layer can be displayed, changed, or erased independently. Layers can be displayed in any combination to let you see how all or various parts of the figure fit together. The number of layers available depends on how much memory you have in the PC; a minimum CADplan system with 320K RAM can have up to 10 layers, and a 640K system can produce drawings with 65 layers.

The contractor uses the View command to determine what layer the plumbing information is on (again, adopting standard practices would help), enters that layer with the Lay command, and crases the plumbing information. All the other layers remain the same. If he had wanted to retain some information on the plumbing layer, he could have used the cursor to draw a window around the area he wanted

He now converts the wet bar in the original plan into a closet by calling in specifications for a closet that he created previously and stored in a separate file along with drawings of porches, windows, and other structural elements a contractor often needs. The initial preparation of small files that hold diagrams you com-



Top: A rectangle created with the rubberbanding function and ready to be manip Bottom: When you finish working with a shape and leave the rubberbanding mode, the

sides of the shape firm up monly use takes time, but you have to do it | only once. After you create them, you can

improves accuracy. Two other CADplan functions make

tile. The Zoom command moves the view toward or away from a specific portion of ioin common elements together in an eleca drawing. Zoom is complemented by the tronic cut-and-paste that saves time and Pan command, which moves a drawing horizontally or vertically across the screen. While designing the new addition. the program even more flexible and versa- the contractor might pan across the draw-





Two perspectives on a house in different stages of planning. CADplen lets you save and call up the various stages for later use.

ing to find the portion describing the window and then zoom in to expand that detail on the screen.

The Zoom command moves in and out in steps of 2X power magnification. In a magnified mode, you can create text or figures that will not be legible when you

have moved the view away from the drawing, yet they will reproduce properly when the drawing is sent to a plotter or printer. The Pan command lets you select a new center for the display. You can move the viewing screen in any direction across the drawing, but you must have the screen

redrawn after each move, which means you can only jump the equivalent of one screen at a time. CADplan displays the X and Y coordinates of the cursor on the screen at all times. The screen shows about 600 vertical points and 840 horizontal points, and CADplan can create drawings with 60,000 points.

In Another Dimension

The accuracy of a drawing's dimensions is important in almost all applications. (ADplam provides accurate dimensioning with a Restile grid system that you can call onto the screen whenever domesions can be stored for recall. When the grid is on the screen, you can order lines and figures to align themselves to the nearear grid line. The CADplam annual says that the lines "smap to" the grid, and this is an accurate description.

An optional Auto Dimensioning module (available separately) can be integrated into CADplan to automatically measure the distance between two points you designate, draw the dimension line you want, and add text and numbers in a size you select. This module is very flexible; you can position text anywhere along the

Rubberbanding gives CADplan a major advantage over paper and pencil line drawing.

dimension line or allow the program to center the text on the dimension line for you. You can put text vertically or horizontally on any dimension line and define dimension lines with the cursor or by entering numbers representing specific coordinate points on the screen. You can also determine the number of decimal places the program uses when it labels the dimension lines.

The automatic dimensioning capability

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609 683-1660 TLX 6857009 PGS Prin of by Rell and Howell Service Company and MAI Sorbus Service Co. is a worthwhile addition to the CADplan package. Personal CAD Software's decision to market this module as a separate item may cause you to overlook its value, which is unfortunate.

Our hypothetical contractor should be about ready to produce his drawing. The primary output of almost all CAD systems eventually has to find its way onto paper, so the ability of CAD software to worth your policer or printer is very important. CADplots supports nearly a dozen different policers, and the Eposon IBM domastrix printer. The plotters that will work CADplots include the most power with CADplots include the most power of the CADplots in District Management of the CADplots in D

CADplan's printing and plotting routines allow you to select various portions or layers of the drawings to reproduce. Since you can select the scale for each reproduction, you can easily produce blown-up views of a portion of the drawing. The CADplan interface with printers and plotters is both effective and simple to use.

The Critical Step

The production of the drawing is an important step in the preparation of a bid, but eventually the critical question must be answered: How much will it cost? Every project, from small home improvements to the construction of nuclear power

plants, has an informal or formal document called a "bill of materials" associated with it. The bill of materials tells you what parts and supplies you need to do the job and may include information on size, color, manufacturer, supplier, stock number, and price of each item. The bill of materials helps you determine what the project will cost, where the materials can be ordered from, and perhaps even when

they should be ordered and in what

sequence they should arrive.

The production of the bill of materials can be a tedious manual job, but a \$350 optional module for CADplan called Data Base Extraction goes a long way toward automating this repetitive process. This module is properly designated as an option because while it is comprehensive, not all users will need it or choose to master the programming skills it requires.

Adding Up

The concept used in this database program is that every symbol and line in a drawing can have certain attributes attached to it—such as size, weight, and color. (For an example, see Figure 1.) When you complete a drawing, it will contain important elements such as left-hand-opening doors, right-hand-opening doors, electrical wiring flootage, plumbing, and perhaps hundreds of other items.

Our builder goes through his drawings:

he counts the doors, windows and wires, compiles a list, writes a description for each item, finds the price of each, and computes the costs in various categories. Done manually, the job could take from

The automatic dimensioning capability is a worthwhile addition to the CADplan package.

hours to months and almost never produce a list current with the latest changes in the plans of a large project.

CADplan can, with some internal programming, perform all of these functions in minutes. Of course, all of the attributes associated with a symbol must be entered once and then be kept current. But if you have a big project or more than one project underway at a time, the benefit is worth the initial investment.

The Data Base Extraction module relies on two kinds of files. The first is a text file that contains the various attributes for each kind of figure and can be created easily with any word processor that creates standard ASCII files. Each major attribute is set off by two asterisks and typed in capital letters. As an example, the data describing where a contractor can order material might be contractor can order material might.

VENDOR
Acme Electric
123 45th Street
Bridgetown, Barbados.

West Indies
The extraction program will look for the
attribute heading and withdraw the material following the heading.

The second type of file is a command file. Writing a command file requires the same programming skills you need to write a simple program in BASIC or Pascal, but the format of the command file is

```
CREDENZA
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Figure 1: This file holds the "attributes" or needed information describing a piece of furniture called a credenza.

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```
Listing of CADPLAN cossend file celled : DEMO
"This is a deep of various capabilities of "CADPLAN"
"You should have loaded MEMPCAD1 and windowed out an
"with 2 points, hereefter called P1 and P2."
                                                       ed out en eree"
"The X distance between P1 and P2 is"[---DELTAX---]
"The Y distance between P1 and P2 is"[---DELTAY---]
"The AREA of the defined window ie"[---AREA---]
"Square Feet"
"Assuming 8 foot ceilings the volume is"[---AREA---] = 8
"Cubic Feet"
 "The total length of the welle on leyer #6 ie"[---WALL---]
"Enter the cost of building the wells (per linear foot): "
"The total cost of building the wells is" [---WALL---) . [---WCST-
```

Figure 2: This listing shows a command file written using the CADnlan Data Rose Retrieval language. The commands are simple but not intuitive.

not similar to either language. To use the command file capability, you not only have to learn the format once, but you have to review it unless you use the program frequently because of the number of commands, syntax, and alternatives in the command language. Any business electing to use CADplan with the Data Base option will have to institute a program to train and refresh employees in the use of the command language. The menu of commands to create drawings is intuitive, but the database command language is not. For example, a program that computes the cost of wire used in a building's electrical system contains seven lines of program code that contain brackets, asterisks, dashes, plus signs, and other symbols that do not have intuitive meanings (see Figure 2).

The merger of a database program and a drawing program gives CADplan a great deal of potential power. But the addition of a function generator or a menu-driven approach would make the Database Extraction module much easier to use and more valuable for users without programming skills.

Bill of Materials

slightly modified the command file associated with his old drawing to account for the increased space. He has also run the file to produce a bill of materials and list of costs. He can prepare his bid by taking the costs and adding the overhead and profit he thinks the buyer will accept. The entire session took him less than half an hour (longer if many drawings were produced on a plotter), and the contractor now has a competent bid to present, accompanied by complete drawings and a bill of materials. This kind of bid is likely to inspire confidence in those who receive it and result in profitable rewards CADplan is not an inexpensive pro-

gram, and it takes a well-equipped system to run it. The program eats memory like PacMan eats blue ghosts, so while 320K memory is the minimum, more memory is useful for complex projects. The main CADplan program is on a copy-protected disk and cannot be transferred to a hard disk, but The Data Base Extraction module can benefit from the fast access times a hard disk provides. Because of its intensive use of graphics, CADplan requires the IBM Color/Graphics card. Although it will work with a standard monochrome monitor attached to the Color/Graphics Our computer-assisted contractor has card, an RGB color monitor provides a uch better display.

After I had used the program for several days, I installed a mouse. I was perfectly happy using the cursor keys to control the display. While the mouse did speed up the process by moving the cursor faster. I found that the keyboard didn't divide my attention among the screen, keyboard, and a third working area.

Personal CAD Systems claims that CADplan can be used with a digitizer system, which is a device that can trace existing drawings and select, or digitize, various points of reference for automatic entry into the computer. A digitizer is an effective but manually tedious method of entering into the system drawings that only exist on paper. Automated scanning systems for paper drawings are still on the drawing board.

CADplan can be an extremely effective tool for design projects, but like many good tools, it takes skill and practice to use it effectively. Some professional discipline is needed to ensure that users establish and follow standard practices. The

When you complete a drawing, it will contain important elements such as electrical wiring footage, plumbing.

manual provides only the fundamental information you need to use the program; it won't help you through the rough spots. Some editing techniques must be learned through trial and error. The Data Base Extraction module can add a useful function to the basic design program, but you need training and experience to use it effectively.

CADplan is a serious program for serious users. It can be an invaluable tool for people or companies that will make a commitment to using its power on a full time



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out small businesses could probably use the help of an automated accounting system. Unfortunately, much of the accounting software on the market goes far beyond the needs (and budgets) of yeary small businesses. BOONS: The effective Ledger is on exception. If your transactions under a limited number of transactions and a limited number of transactions and a limited number of transactions and the second properties requirements. BOONS: may be just the system you're looking for Marketed by Systems Plus, fine, the

package is based on The General Ledger Module, which serves as a foundation for a complete BOOKS' system. Four optional modules are available: Recurring Entries, Budgeting, Check Writing (which includes Accounts Payable), and Invoicing. These optional modules may be purchased independently.

We tested BOOKS' and found that its unique approach and ease of use make it an ideal bookkeeping package for small businesses converting from manual to automated accounting.

Most small business accounting packages for the PC process subsidiary transactions, which are then summarized and passed on to a separate general ledger. For instance, you may buy a system that can process order, invoice, and payment transactions, the financial impact of which is summarized and passed on to a separate general-ledger system.

BOOKS! takes a different approach. With BOOKS!, you are always working with the general ledger. Subsidiary transactions are first recorded in the general ledger; then, if appropriate, you provide additional information to create invoices, prepare checks, record payables in a vendor's account, and so on,



BOOKS! The Electric Ledger Systems Plus, Inc. 1120 San Antonio Rd.

Palo Alto, CA 94303 (415) 969-7047 List Price: The General Ledger Module, \$345; Recurring Entries, \$75; Budgeting, \$150; Check Writing (with

Accounts Payable), \$75; Invoicing, Requires: 128K RAM, two disk drives, 132-column printer or 80-column

printer with compressed print. CIRCLE 709 ON READER SERVICE CARD

As illustrated in the sample screens accompanying this review, BOOKS! continually reinforces the general ledger orientation. Whether you're entering a journal or requesting that a check be printed, you are always using the same ledgerlike screen format. To quote the BOOKS! manual, "The screen display that you will use to make your journal entries looks like the page from your journal book, making your transition to electronic accounting faster and easier."

Starter Charts

When you purchase BOOKS!, you receive a "charts" disk, which, among other things, contains ten predefined charts of accounts (that is, general-ledger accounts). Charts tailored for seven types of businesses-construction, manufacturing, professional services, repair and service work, retail sales, wholesale sales, and personal-are included on the disk, along with a master chart, a program demonstration chart, and a bookkeeping tutorial chart. The master chart includes all of the accounts that are on the "custom" charts. The program demonstration chart, which is used with the system's demonstration booklet, gives a thorough introduction to the system. The bookkeeping

tutorial chart is for use with the short written tutorial on basic accounting, which you will find included in the BOOKS! manual

These predefined charts can be a great

help in setting up BOOKS! for your business. You can select the chart that most closely resembles the chart of accounts you need and modify it accordingly.

Setting up a chart for BOOKS! entails more than simply entering new account names. For each account, you must specify where it "fits" into the predefined balance sheet and income statement. You can also specify whether each account is usually a debit or a credit amount to speed the entry of journal transactions.

Another unusual feature of this program is that it doesn't use account codes. Instead, you simply move the cursor to the By directing your general journal Ac-

account title and hit the Enter key to specify an account.

BOOKS! uses a three-level chart of accounts. The major account headings are called summary accounts: below summary accounts you can define intermediate accounts, and below them, subsidiary accounts. This structure makes it easier for you to summarize and report accounting records and lets you maintain subsidiary records for accounts receivable, accounts payable, and job costs.

Both the balance sheet and income statement list only summary level accounts, which must be set up accordingly. For example, the model charts each contain a summary account for Payroll Insurance and Taxes, with intermediate accounts for Social Security Tax, State Unemployment Tax, Federal Unemployment Tax, Workmen's Compensation Tax, and Hospitalization Insurance.

This arrangement provides you with the necessary (intermediate) level of account detail, but only the summary account will be reported in your financial statements. In this scheme, entries are made only to the intermediate accounts. BOOKS! will automatically total the intermediate accounts to generate summary level financial reports.

You can maintain subsidiary ledger accounts by establishing appropriate summary and lower level accounts. For example, the BOOKS! demonstration chart has the following accounts:

> ACCOUNTS PAYABLE AMF Voit. Inc. Invoice Received Payment Made Merchandise Returned Hoerster Supply Invoice Received Payment Made Merchandise Returned New Balance Company Invoice Received

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counts Payable entries to the appropriate intermediate and subsidiary accounts, you can keep track of obligations due and payments made to various vendors. To accommodate check writing, you can enter and maintain vendor address information for each of these accounts. BOOKS! is a far cry from a full-fledged accounts payable system, but it should meet the needs of many small busi-

Through the Ledger

The BOOKS! accounting modules lead you through each step necessary to process an entry with a series of prompts and menus, which are always presented on the lower left-hand quadrant of the screen. To select menu options, you use the arrow keys to move the cursor to the appropriate line and hit the Enter key to see the results of your choice.

Anyone familiar with Lotus' 1-2-3 will recognize this approach. With 1-2-3, you can also make a selection by typing the first letter of the menu option you choose. Unfortunately, BOOKS! doesn't provide this convenience.

On the brighter side, an alternate method can be used to select an account. Before entering an account, the list of accounts appears in the lower right-hand corner of the screen. You can either move the cursor to the proper account title and hit the Enter key, or begin typing the account name. As you type the letters, the system further matches the account name with the list of existing accounts. Soon the cursor will be resting on the proper account name and you can then hit enter. This saves a great deal of time when making journal entries.

The authors of BOOKS! went out of their way to ensure that the system keeps you informed about what you're doing, and in what context. Figure 1 illustrates how this is accomplished. Let's say, for example, that you have just received a shipment of water skis from Orlando Water Skis, and you're accounting for your business on a cash basis (which

means you're not using accounts payable). As you can see in Figure 1, it's clear that you're on the "Make Journal Entries" module of the BOOKS! system. Having decided to prepare journals, you then

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of accounting.

selected the "Make Entries and Write Checks" option to record the transaction and prepare a check. You choose the "Prepare Non-Payables Checks," which indicates that this check will not be in payment of an existing amount due your vendor (Orlando Water Skis). After recording the purchases, totaling \$1,300, you selected "Complete the Balance of This Check" and further chose to "Enter a Discount."

You are now poised to enter a discount, and the system is offering you the choice of doing so as a percentage or as a dollar

As Figure 1 illustrates, your trail of menu selections is maintained on the BOOKS! display screen. About 20 percent of each screen is used to display messages to the user. This is another feature that makes this system so easy to use and reflects the thoughtfulness of the program's designers.

Software Protection

When you purchase the system, you receive a complete set of software, wheth-

er or not you paid for all of the modules. The dealer gives you a 15-character code, which is a function of the modules you've paid for and the serial number of your copy of the program. To actually use the software, you have to "de-encrypt" it by entering this code, which causes the system to "unlock" the BOOKS! software you purchased.

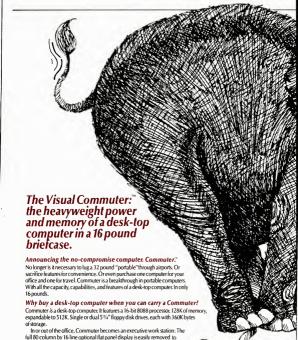
Unfortunately, the poor documentation that comes with BOOKS! made de-encrypting the software impossible until a representative of Systems Plus explained the process, step by step, over the phone. Once explained properly, it's not difficult; the process is similar to the installation procedures for a word processor or database system.

You can access optional modules you haven't paid for, but BOOKS! won't let you enter amounts over \$99.99. This is Systems Plus' way of giving you a demonstration of the package's options and showing you the program's additional capabilities. When you purchase additional modules, your dealer will give you a new code to access them, and, once deencrypted, they will be automatically updated with information from the general ledger.

Productivity Boosters

BOOKS! provides you with several convenient features aimed at increasing your productivity. You can set up "abbreviated" charts of accounts that list only the most frequently used accounts. For example, when you're paying monthly bills, you may want to use an abbreviated chart consisting only of your usual monthly expense accounts. This saves you the time and trouble of picking your way through the entire chart. If you don't find an account you're looking for on the abbreviated list, you can hit the Esc key to access the entire chart.

Another timesaving feature allows you to establish what BOOKS! calls "following accounts." When entering journals, you can often predict the next account(s) needed to complete a journal. "Following



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accounts" lets you identify ahead of time one or more accounts to be presented by the system after using a certain account. For example, you might develop your cash accounts as follows:

CASH
Springfield Marine Bank
Deposits
Withdrawals

If so, you may want to specify that, following your use of the Deposits account, the system should present the following list of accounts:

> SALES ACCOUNTS RECEIVABLE INTEREST INCOME OTHER INCOME

Using this facility properly will probably save you time and reduce errors, too.

BOOKS! allows you to define one or or recurring." journal entries. You can enter these "standard" journals just once, give them a unique name, and call them up each month for entry into the new journal. This is a convenience feature; if the amounts of the entries change, all you die enter the new amounts prior to posting.

Another handy feature of BOOKS! allows you to annotate each of your ledger entries with an unstructured comment of up to 512 characters. This can considerably improve the clarity and comprehensiveness of the journal entries in an audit trail report.

BOOKS/ has only a limited capability for develoging reports in formats other than the standard formats supplied with the system. But the system's "undefined reports" only provide for listings of selected accounts and their respective balances, which must be listed in the order in which they appear in the chart. This feature is not all that useful, since one of the states and reports allows you to print (to paper on disk) secounts and balances, annway.

There is a way to customize reports. BOOKS! allows you to "print" any of your reports to a disk file. You can then read these reports into your word proces-

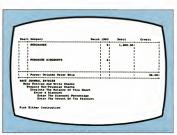


Figure 1. When making entries, BOOKS! continually reminds you of what you're doing as it prompts you for the next response.

sor or spreadsheet program. When you install the software, you can request that these reports be placed on your disk either in ASCII format or as document files for use with either WordStar or Spellbinder. This feature lets you customize the format of

financial reports on your word processor. If you choose to purchase the BOOKS! invoicing module, you will be able to develop sales invoices as you enter sales transactions into the ledger. This is done within the context of the general ledger.

Invoicing is done as follows. After choosing the "Make Entries and Write Invoices" option and making the appropriate journal entry to record a sales transaction, you are prompted to enter the additional information needed to complete a sales invoice. You can create invoices either for the sale of product or for services either for the sale of product or for services entry the product of the sale of product or for services.

rendered, which are then printed on special forms available from Systems Plus. Like other BOOKS! reports, invoices have a

fixed format.

The sale can be charged to a specific customer account—that is, if you've set up the customer as an intermediate or sub-

sidiary account of, say, the accounts receivable summary account. Payments received will then be credited to the customer's account.

If you need an invoicing or accounts receivable capability and you're considering BOOKS', look carefully at exactly what these modules will and won't do. If your needs are simple enough—great. But don't expect your general ledger to blossom into a full-featured order and invoicing management function. It won't.

The BOOKS! budgeting capability is unique. Most microcomputer systems that provide for budgets simply allow you to neter, maintain, and report budgeted amounts for each general-lodger code. BOOKS! allows you to set up multiple budgets, each one for a group of accounts. You can budget at the summary, intermediate, or subsidiary level, but for any given multiple budgets all accounts must be at each property of the summary to the summary to

The nicest thing to be said about the ease of learning and using BOOKS! is that it can be done in spite of the documenta-



- This ledgerlike display format is used throughout the system.
- 2. This is the main menu of BOOKS!. Most day-to-day work is done with the "Make Journal Entries" option.
- 3. Prompts always appear here.



- 1. You can enter a remark of up to 512 characters under each journal entry.
- 2. This company has set up lts vendors as intermediate accounts, subsidiary to Accounts Payable. This will allow the company to track obligations due and payments made to each vendor. For each of these accounts you can enter address information, which will be used for check writing purposes.

tion. Inaccuracies abound throughout the "preliminary" manual. A number of the display screens offer choices that are not tillustrated or explained in the manual. And even though the manual discusses how to print customer statements, the program wouldn't do it. Systems Phus supplies a main-in order card to purchase forms designed to work with the system. Yet Systems from the system is specified to work with the system in the system of the system of Systems and the system is the system of systems and systems are systems and systems syst

The folks at Systems Plus have been scrambling to improve the manual, and better documentation should be available soon (if it's not already).

There is one problem that should be classified as a "bog" in BOOKS! The problem can be especially distressing from the problem can be especially distressing from the problem of the programs within the "Display Entries and Balances" module—which is used to display account data on the screen—call for the printer to be in "ready" state. These functions have no need for the printer, yet they dish't not need to the printer, yet they dish't as this was, it should be only a miltor inconvenience to most users.

You have to keep your disk drives ready when BOOKS! wants them, too. Otherwise, the screen display may shift up two rows, causing the headings on the ledger display to disappear.

BOOKS! can be run on PC with 128K RAM and two floppy disk drives. The entire system contains about 400K bytes of code, which won't fit on one floppy disk, so some disk swapping is required. It does access the disks quite a bit, and it operates a lot faster on the XT.

BOOKS! is an appealing, automated lodger designed for simple bookkeeping activities that focus on the general ledger. All of the firstration resulting from its less-than-friendly documentation is outweighed by its overall ease of use. Its simplicity and its unique approach may make it just the right accounting system for your business.—G. William Dauphinals

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scientists and others plot and

data, and find the mathematical

model to best fit a given data set.

Scientists and others who use the computer for experimental and research purposes are often faced with the difficult task of converting raw data into a significant form and presenting the results in useful graphs and reports. The Data Evuluation Program for the BM Personal Computer (DAEPPC) from R. & L. Software can do just that. It remploys a conditional set of routines that employs and the set of the s

accuracy of its own work.

DAEPPC's chief applications are in the sciences, and the program operates to the five levels, each of which helps scientiss perform a variety of tasks. The first level allows you to graph numerical data from a particular type of study or investigation, cities a serior and the propulation of cities as er of numbers with each of several items—for example, the population of major cities in the United States as reported in the 1980 census. Comparing a second set of observations with the first reveals any changes in the data, but doing so requires that you use two values for so requires that you use two values for





each item. To snow which others are growing, you would need to compare the 1980 census with the 1970 census. DAEPPC's plotting capabilities can graphically illustrate this type of information.

Many scientific experiments attempt to confirm known physical laws as an educational process. Beginning physics stadents, for example, might measure the time it takes for a pendulum to make a complete back-and-forth oscillation. The could use DAEPPC to graph a set of data points that would indicate time measurments for different pendulum lengths. For comparison, calculations using the known equation of pendulum motion provide the theoretical period of oscillation values. In its second level, DAEPPC can contrast the calculated freeeredeal values with the me-

Data Evaluation Program for the IBM Personal Computer R & L Software

1299 Beacon St. Newton, MA 02168

List Price: \$250 Requires: 128K RAM, BASICA, one single-sided disk drive, color/graphics

CIRCLE 736 ON READER SERVICE CARD

DAEPPC's greatest power is that it can quickly test a variety of mathematical models to determine which one best fits the data sured das. At the third level—where only measured data is available and the governing physical equation is not yet known—DAEPPC demonstrates its greatest power. Here, it can quickly test a variety of mathematical models to determine which one best fits the data, and therefore which capation for the actual governing equation for the actual governing equation is likely to take. This iterative process uses the extensive actualities of which we have a considerable and the control of th

A Physics Lesson

Figures 1 and 2 illustrate an application of DAEPPC to the pendulum case. For small oscillations, the period of a simple pendulum can be approximated as:

pendulum can be approximate $T = \sqrt{\frac{1}{I}}$

For T in seconds, I is the pendulum length in feet and gravity's acceleration g is taken as 32.2 ft/sec².

The purpose of this example is to describe the period of oscillation of a pendulum as a function of its length. The column X-OBS in Figure 1 indicates ten different pendulum lengths, and Y-OBS gives their period of oscillation, calculated

using the above equation.

The X-OBS and Y-OBS values are upto to DAEPPC as observed data. The last four columns of Figure 1 show the results of two DAEPPC curve-fit runs. The first attempt used a linear model, y are + b, and the percent deviation column shows that it had moderate success in predicting the input y values, achieving an overall wariance of 0.07. The second column shows that it had moderate success in predicting the part of the property of

Figure 2 is a plot of the above data; it graphs the accuracy improvement achieved with the third-order polynomial model. The linear model is a fair representation of the data, but the exponential model points are almost indistinguishable from the original data values.

Once you are familiar with the program entering the input values, making the two DAEPPC runs, and printing the results takes about 10 minutes—a modest investment considering the usefulness and accurracy of the results.

How it works

Now that you have an idea of what DAEPPC does, I'll take a look at how it works. The program's main menu displays 18 available functions at start-up time (see the sidebar, "A Summary of Main-Menu Functions.") The first five functions input the data in the proper format. You specify the parameters required to plot the data using the SETUP function, and the PLOT function graphs the data on the color/graphics screen. FUNCTION specifies which math model is to be used for evaluating the data, and FIT performs the curve-fitting process. This command outputs a display comparing the original data with the results calculated by the selected math model and provides an option to send the numerical results to a printer

The SAVE DATA and PRINT DATA

INPUT DATA		LINEAR MODEL		POLYNOMIAL MODEL		
	,		Y = H		Y = 4x + Bi	2 + Cx +
	PENDITUM	PERIOO				
	LENGTH-	TIME-	7		7	
	FEET	SEC.	i	- 1	i	i
PT.	x-oss	Y-089	Y-CALC	ZDEV	Y-DALC	ZDEV
	5.	2,4800	2,9849	16.92	2,5070	1.08
2	10.	3,5000	3,5578	1.63	3,4605	-1.14
3	15.	4,2900	4,1307	-2.86	4,2724	-0.41
3 4 5	20.	4.9500	4.7036	-5,24	4.9647	0,30
5	25.	5,5400	5,2765	-4.99	5,559R	0.36
6 7	30.	A. 0A00	5.8495	-3.60	6.0796	0.32
7	35.	4.5500	6.4224	-1.99	6.5463	-0.06
8	40.	7,0000	6.9953	-0.07	6.9820	-0.26
9	45.	7,4300	7,5682	1.83	7,4089	-0,29
10	50.	7.8300	8.1411	3.82	7.B490	0.24
				FINAL PAR	NAMETER VALUES	
			M = 0.	1146	A = 2.9	5104E-05
			B = 2.4	1120	B = 3.7	17956-03
					C =	0,2413
					p =	1.3897

Figure 1: Input data and numerical results from two curve-fit runs show that o polynomial model is better than o linear model for modeling pendulum oscillation time.

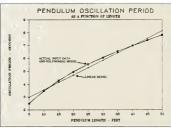


Figure 2: This graph of the input dato ond two curve fits from Figure 1 clearly shows that the polynomial model is very close to the original input data.

functions verify that the data was entered correctly, they can also recall it for additional comparison runs. LABEL AXES (option 14 from the main menu) inputs labels for the graph axes, and LABEL GRAPH (option 15) puts titles on the graph. Comparisons with additional sets of data use the input function ENTER AND (option 16). The colors of the graph

axes, plots, and labels can be selected with the COLORS function. The GRAPH function plots the graph using the current data and parameters as specified with the other functions.

All DAEPPC sessions begin with the entry of data values. After data entry, the process can take several paths. The examples in the 91-page manual carefully detail the exact sequence of steps to be followed, depending on the desired fluction. Many second-level menus use function keys sand the function-key labed slightlyed by BA-SIC to indicate the most logical next steps. Figure 3 shows a flowchart of normal progressions through the functions and can be used as a quick reference guide for learning the logical sequences of the many pro-

gram functions. Input values are designated as X and Y, with individual data points specified by subscripts such as X_I or Y_I . A prompt requests the entry of each pair of datapoint values after you inform DAEPPC of how many points to expect. Specifying the appropriate file name recalls data saved on disk from a previous run. Up to 100 points can be entered: individual values must fall within the limit allowed in single-precision BASIC. You can select simultaneous printing of the data points as they are entered. After data input is complete, the CHECK function displays the values for verification. EDIT can then insert, delete. or correct individual data points.

R & L. Software should address several imitations in its next version of DAEPPC. The EDIT prompt displays the current value, but it must still be rekeyed even if no change is desired. SAVE DATA stores the input values on disk under the specific file name, but the current version of the program does not check whether a first that you could wipe out the contents of one of those files shall be supported to the contents of one of those files first that you could wipe out the contents of one of those files shall yet saily.

If all data points represent single values, as they do in the crasus example, or if the X values are all the same, then the AVERAGE function can automatically calculate the average of the Y values. The BASELINE function adds or subtracts a constant from each Y value, which moves the graph up or down on the coordinate

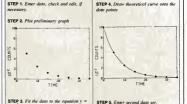
The NORMALIZE function divides all the Y values of the data points by the largest Y value or a user-supplied constant, which makes it easier to display data with widely ranging values. It's also useful

where the main subject of an investigation is the shape of the graph rather than the data values.

Rerunning the CHECK function shows the results of the previous data adjustment actions. You can run SAVE DATA as often as desired to save the data after conversions and adjustments. EDIT is always

available for correcting individual values, and PRINT DATA allows you to create a hard copy.

Data is saved in a sequential file in ASCII format. The first record indicates how many data points follow. Any word processor, text editor, or program editor that uses and outputs standard ASCII files



AN EXAMPLE OF THE DATA EVALUATION SYSTEM

Analysis Of A Radioactive Decay

A.e-kt STEP 6. Repeat STEP 3 E E E SATA EVALUATION SYSTEM E E E E FINC-ORESE STEP 7. Repeat STEP 4 INCTER, PROPRETER VALUES STEP 8. Drow finol graph 40° 1.500€ 3 FINE PROMETER VILLES Apr 1-001E 3 1-08.0 1990,9800 1801,546 500,454 10,0000 247,0004 254, 3138 15,0000 126,0000 125, 2001 43.0000 12.4217 -. 400 31,379 CRIPCING TRACE, N \$317214,71425-00 CDF(F1,F2)++3.52846-04

Figure 3: A flowchart showing the normal sequence for using DAEPPC.

HM: J. 13375+00

FUNCTIONS CURRENTLY AVAILABLE				
Number	Name	Equation	Fit Parameters	
1	LINE	y*#x+8	x,2	
2	POPA3	y=Ax2+3x+C	A,B,C	
3	POLY3	y=Ax3+8x2+Cx+0	A.B.C.D	
4	HYPRLA	y=Kx/(x+E)	N,E	
5	EXPR	y=A_exp(-kx)+8	A ₀ ,B	
6	DEXP	$y=\lambda_1 \exp(-k_1 x) + \lambda_2 \exp(-k_2 x)$	k1,A1,k2,A2	
7	ORD1P	y=k_{f}-(k_{f}-k_{i})exp(-kx)	E, A, Ag	
	ORDIR	y=A _o exp(-kx)	k , A ₀	

y=A₀=1/(kx+(1/A₀))

v=1/(kx+(1/A_))

Figure 4: The ten math model equations supplied with the program package.

can revise data values once they are saved.

ORDZP

Setting up the Plot

DAEPPC demonstrates its true power and flexibility with the SETUP and PLOT commands. SETUP automatically performs the scaling-one of the most difficult tasks of plotting. Scaling determines the value of the divisions on each axis so that all the values of the available data points will fall on the graph. Selecting the best method of scaling is frequently a matter of judgment. The most interesting portion of the data should be spread as widely as possible on the graph. DAEPPC's ability to quickly display the current plot and then rerun the program with revised scaling lets you optimize the graphic presentation of the data to improve the results of the automatic scaling facility. You can use SETUP only once per run, since, to appear on the same graph, additional data sets must fit on the same axes. The program won't let you wipe out; it prohibits a second call to the SETUP function. Similarly, it gently reminds you to perform SETUP before trying to perform the initial plot.

To display a graph in color you must take a few more steps. PLOT offers more options here. First, you must decide what

part of the data to plot by specifying the index of the desired starting and ending points. DAEPPC expects a response like 1,50, for example, which indicates that you want to plot all of a set of 50 input values. Then you must decide which of nine possible graph symbols—ranging from a line to a diamond to a filled square—you want to use.

PLOT then erases the screen and draws.

k.A.

k,Ao

the graph. The axes appear first, then the

Any word processor, text editor, or program editor that uses and outputs standard ASCII files can revise data values.

scales, and finally the data points. This is your chance to watch your PC strut its stuff. Extensive calculation is required to determine the screen position of every point in a graphic line, but the process is all completed in a few seconds. If a line symbol has been selected, the graph is drawn from left to right as a continuous curve connecting the data points. A color/graphics monitor adapter board is necessary to display the graphics output. (Other portions of the program and the curve-fitting routine will run on a system with a monochrome display adapter and monitor.)

The Plot Thickens

DAEPPC saves the initial display of the plot in graphics form in memory and makes available a series of new options. The F1 key is armed for returning to the main menu, from which the new options can be selected. Pressing F5 turns off the function key definitions display at the bottom of the screen so that graphs can be photographed without showing the function key labels.

The LABEL AXES function accepts alphanumeric strings that will be displant on the plot as albels for the X and Y axes. The LABEL GRAPH function sets utile for the entire display. The graph can be redisplayed in its current state at any time with the GRAPH function. Colors for the graph display can be chosen and modified using the COUORS function.

At this point, the main merul's mysterious ENTER ZND function can be used to enter a second set of data for comparison with the first. Selecting this option resets the data input processor and again provides the choice of entering data from the keyboard or from a disk file. All the data manipulation functions, such as CHECK, BASELINE, EDIT, SAYE DATA, BASELINE, EDIT, SAYE DATA, PRINT DATA, and so on, will now operform the comparison of the comparison of the Reselecting the PLOT function allows you to use a different symbol for graphic new data values. This clearly distinguishes the two sets of dress.

Additional data sets can be entered and graphed by again selecting the ENTER 2ND function, but be sure to save the previous set for possible later use. ENTER 2ND clears the previous numeric data from memory as soon as it is called. Once

plotted, however, each data set on the graph remains available for display with the GRAPH function until the program is terminated.

A Fitting Conclusion

Now DAEPPC is ready to display its major-league muscle—the power to mathematically model the input data and compare the model results with the data both numerically and graphically. This process is invoked with a sequence of the FUNCTION, FIT, and PLOTFUNC func-

tions. Ten math models are available for generating the equation form that best fits the data. The modeling equations include a linear function, second- and third-order polynomials, hyperbola, single- and doube-exponential decay, and first- and second- order reactions. The distribution disk includes a file for each model, and additional models are available from R&L

Selecting FUNCTION presents a second-level menu for choosing the desired equation. Figure 4 shows the form and the names of the supplied modeling equations. DAFPPC confirms the selection by giving the name of the requested equation. FIT determines the values of the model equation constants that best represent the input data. The function uses a nonlinear, least-squares fitting procedure to determine constants that minimize the sum of the squares of the deviations between the input data values and the calculated data values. Depending on the model, it may request that the user input an initial estimate of the constants of the model equation

The third step in Figure 3 shows the numerical results of a typical fit process including the final constant values of the model equation along with any initial estimate. The program then lists the original data, the calculated model value, and the percent deviation between the data and model values for each data point. Statistics are presented to summarize how accurately the model represents the input data.

FIT provides an option to print out the numeric results. Selecting PLOTFUNC displays the previous graph of the input data and plots the theoretical values on it for comparison. The entire process can be repeated using a different math model if it appears that another equation might gen

The program lists the data, the model value, and the percent deviation between the data

and model values.

erate a better fit for the data.

The system's advanced features include the capability to specify individual

scales and intervals on the plot axes, Poisson or proportional statistical weighting to the data points, and the use of the PLOT-FUNC routine to generate initial guesses at countion constants, if required.

DAEPPC applies the PC's computational power to the time-consuming tasks of data analysis, reduction, and presentation. It adds accuracy to the researcher's ability to make the quick-look judgments necessary to decide how to proceed with an experimental or research effort.

DAEPPC's unique combination of features, together with its plotting capabilities, enables the user to quickly and interactively determine the best mathematical model for representing a set of data. This expands the application of mathematical analysis to scientific and engineering research and development areas where, until now, only approximate methods had been practical.

A Summary of Main Menu Functions

Here's a list of DAEPPC's main menu function options, complete with an explanation of what they do.

I ENTER DATA: Inputs a data set from disk or keyboard.

2 CHECK: Displays the current data set on the screen. 3 AVERAGE: Averages a data set if it

has multiple data at the same X value.

4 BASELINE: Adds or subtracts a constant value from each Y value.

5 NORMALIZE: Divides the Y value.

5 NORMALIZE: Divides the Y values by the highest Y value or a user-selected constant.

6 SETUP: Specifies scaling parameters or auto scaling.

7 PLOT: Selects plot character and gencrates the graph on the display screen. 8 FUNCTION: Selects which math model equation to use for curve fit. 9 FIT: Performs a least-squares curve fit process. 10 PLOTFUNC: Plots theoretical curve, using either known parameters or the results of the curve fit.

11 EDIT: Revises, inserts, and/or deletes individual input data points.
12 SAVE DATA: Transfers the current input data to a disk file.

13 PRINT DATA: Prints the current input data.

14 LABEL AXES: Inputs strings for labeling the X and Y axes of the

15 LABEL GRAPH: Inputs a title for the graph.

16 ENTER 2ND: Enters a second set of data to be compared with the first.
17 COLORS: Selects the colors for the graphics display.

18 GRAPH: Displays the current plot.

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Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
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Graphics Display (640x200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communication Port	YES	OPTIONAL	YES	YES
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SOFTWARE/BARBARA KRASNOFF

Researchers are working on a program that will let you use your PC to plan and produce your own integrated circuits.

PPL Cultivates Circuits for Micros

There is a popular assumption that in order to plan and produce integrated circuits for microcompaters, a more sopisticated machine—a mini or a mainframe—is necessary. But researchers at the University of Usa well on their way to generating integrated circuits for micro, mini, and even micro circuits for micro, mini, and even micro integrated in the computer susing nothing more than a regulation Blan PC with 2548, RAM. They have devised a series of programs that use similes versibels made un for littles and other keyboard characters to represent circuit functions. This allows PC users to design, develop, and ultimately produce sophisticated integrated circuits.

Integrated circuits (1C) are a group of interconnected circuits that are usually placed on a silicon chip, making up a single electronic function. The new software, developed by Kent Smith, Brent Nelson, and Tony Carter of the University of Utah's computer science department, is called Path Fororammable Losic (PPL).

It was drawn from an arithmetic methodology called Stored Logic Array that allows users to design circuits using symbols that represent the different functions of the IC.

Kent Smith had been in the integrated circuit industry for about 10 years when he came to the university 4 years ago. "I saw

Integrated circuits are usually designed using cells, each of which represents a circuit function.

the potential of this idea and we immediately set about trying to put it into silicon," he says.

Costly Circuits

Integrated circuits are usually designed using cells, each of which represents a diferent circuit function. A mainframe computer them manipulates these rectangles, polygons, and other symbols into a circuit matrix. This technique, while efficient, is also costly. According to Brent Nelson, who is working toward his Ph.D. in computer science, a Computerwisol ordining machine can run from a million to a million and a half dollars. Even less experience and the computer science are computer science, as Computer science, and computer science, as Computer

"There are a lot of people around, mainly hobbysis and extraofiles, who know about togic, and there are companies with complete boards that they be companies with complete boards that they are companies with complete boards that they are loss of the companies with complete boards that they are loss of the companies with the companies with the companies with the companies of the

Originally, PPL ran on the computer department's mainframe computer. "We got some IBM PCs," recalls Nelson,

A Circuit Tour for Techies Only

The creators of Path Programmable Logic step you through their integrated circuit program.

A block diagram of a simple circuit that that we have designed using the IBM PC is shown in Figure 1. The circuit is actually a simplified version of the transmitter section of a Universal Asynchronous Receiver Transmitter (UART). The actual PPL program for the UART, which we created on a PC, is shown in Figure 2.

This circuit, which occupies 21 rows by 25 columns, is equivalent to an integrated circuit approximately 500 microns high and 1,200 microns wide. PPL can be used to design circuits with as many as 250 rows by 125 columns.

The control file in Figure 3 allows the designer to describe the external inputs and outputs to the circuit, create a file that can be used to automatically build the input and output drivers on the IC, and assign names to wires in the circuit.

The first word of each line is a keyword If it is "rame" then the remain.

der of the line assigns a name to a wire inside the circuit array. If not, then the line specifies the type of pad to which the signal is connected. The next two elements on the line specify the row and column position of the signal in the PPL array. The final titen is the signal name. The information in this file is used by the first pass of the simulation program that does the DC analysis, which uses it as it recreases the input life for the second pass

The file shown in Figure 4 is the simulation output. Although the simulator used is a special-purpose PPL simulator, command syntax has been borrowed from MOSSIM, a switch level simulator from MIT.

of the simulator

The first line defines the clocking sequence to be used. The next three lines specify groups of signals to be treated as a unit. The Watch command specifies the signals the user wants to view as the

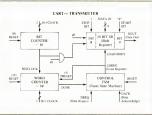


Figure 1: A block diagram of a simple circuit created with the PC.

```
1111111222
20
19
18
16
                                                         D
14
10
                                    R
                               : 0
   :N:E
                                                 R
                               #:3
        D
            D
                D
                         D
 3
        : S:#
              S:#
                  5:# S:#
                           s:
 2 :
        : C:# S:# S:# S:# S:#:
                                                     R
```

Figure 2: The actual Path Programmable Logic program for a UART

Figure 3: This control file lets the circuit designer exercise control over the design

```
A>type uart.ctl
pro 0 13
         lcol phil:
pro 0
      13
         rcol ph12:
   20
       3
         1co1
              d17:
pro
         1 col
               d16;
pro
    20
       5
         1 co 1
               d15:
       6
         1 c o 1
pro 20
       7
         lcol di3:
pro 20 8
         1col d12:
pro 20 9
         lcol dll
pro 20
       10 1col di0
inp 20 23 rcol reset:
inp 20 25 rcol dreg:
out 0 24 rcol dack;
out 0 11 rcol dout;
name 15 15 lcol blto;
name
     15
        17 lcol blt1;
        19 1col b1t2;
       21 1col b1t3:
       15 lcol word3;
name
           lcol word2:
          lcol word1:
     3
       19
     3
       21
          1col word0:
name 3 23
          lcol sm:
name 12 0 row load:
name 1 12 rcol bitclk;
name 10 0 row shift;
end
```

Figure 4: An excerpt of output from PPL's simulation programs.

simulation proceeds. The Set command sets the values of certain inputs to the circuit. The Cycle command then causes the simulator to calculate the behavior of the circuit as a result of the input changes. The new circuit state resulting from the changes is then printed out.

Only a small part of the output is shown here; the vertical ellipses show where portions have been removed. The numbers down the left side show the clock value for the various simulation steps.—Kent Smith and Brent Nelson "and the heads of the department wondered if PPL would fit on a PC. I said "sure" so we did it."

The version of PPL created for the Pcgrams. The first is a text editor called Sententred Logic Editor (SLE). You enter information by typing in the proper symbols and positioning them either with the cursor control keps or a mouse. According to Nelson, the program comes up with a blank window in which you move using the editor's cursor control command. You go to the location in which you want to path the cell and typing the cell with the program interest it into the energy on the server and performs a placemy on the server and performs a place-

"Due to the way the circuits are implement physically, there are retrictions about which cells can be placed next to which. For example, the program won't tely you overlap cells. Certain cells have to be placed in even or odd rows or columns due to their physical implementation when they're produced in silicon. The symbols we use to represent the cells full you the logic that the circuit is going to perform and give you the layout.



A composite drawing of e mora comple: ceil used in circuit designs. This is typical of the type of circuit designed using the PPL software.

"The program is on-line and interactive," adds Smith. "It will tell you when you try something that's not allowed. When you hit the key to enter the symbol, if it's a legal placement the cell will simply appear on your screen in that location. If it in't, the program will beep and print out a little message at the bottom of the screen."

After you have entered all the necessary symbols, the program will take the circuit through two simulations to check for problems that may be inherent in the circuit.

The next two parts of PPL, SM1 and SM2, are simulators. SM1 does a DC (electrical) check to make sure the current will get through the circuit, and a syntax check to be sure that all the connections make sense and that there are no open connections in the circuit.

SM2 takes the program through a logic simulation. You can specify what input you wish to apply to the chip, and the program will calculate the output.

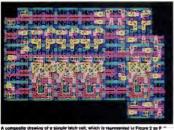
PPL is actually a relatively uncomplicated editing program. "It will mark out a window and you can move the window around, copy it, or delete it—all the normal things you'd want to do with an editor," says Nelson. "Copying a window really means replicating a portion of the circuit; you can define little portions of the circuit and then replicate them where you need them."

All Systems Go

And Systems Got and a fine all the necessions the circuit statistics all the necessions the circuit statistics and the period of format that can be read by the integrated circuit manufacture. "When you're explains from the sing, an integrated circuit," explains from the back of your FC. In a typical provide the back of your FC. In a typical provide the back of your FC. In a typical proper to identify the transistors and the drawing usually represents each layer, a different color is used for each,"

To generate this composite layout, PPL

PC MAGAZINE • MAY 15, 1984

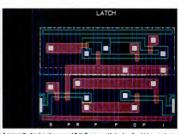


A composite drawing of a simple latch cell, which is represented in Figure 2 as F *
beneath three rows of " ".

goes through each inserted symbol and substitutes the appropriate cell. You would send the resulting circuit to the University of Utah to be converted into the format IC manufacturers demand

The makers of PPL are trying to get corporate funding in order to market their product, which is why they will not release the program necessary to convert the cells into a manufacturing format. Meanwhile, they are using PPL to design circuits of their own. At the moment they are using their PC to build a small microprocessor, but Kent Smith sees no reason why they should not be able to design mainframe components as well.

"I don't know that we would want to design the entire mainframe computer," he says, "although we could. We would do it in small pieces, and when we had enough pieces we would have an entire computer."



sposite drawing of a group of Path Programmable Logic cells which approximate the circuit shown in Floure 2.

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ophisticated graphics have come to the screens of personal computers, but PC users who want to put them down on paper are in for a disappointment. Letter quality printers simply can't handle graphics. Mechanical dot matrix printers can generate graphics and text quickly and inexpensively, but their limited resolution generates poor quality print. Ink jet printers can do the job for a reasonable price, but only at an extremely slow pace. The best way to print attractive graphics and text at a high speed may be with a laser printer.

Laser printers for mainframe computers have been on the market for several years. By writing on a photocopierlike drum with a laser beam, they can chum out text at up to 215

pages per minute; mixed text and graphies can be produced at speeds that are only somewhat slower. The bad news is their price IBM's top-ofthe-line model 3800, for example, sells for \$315,000. However, prices are dropping with the development of new laser and photocopier technoloy. Canon, which retails a "personal

copier" for \$1,200, has adapted its

HARDWARE / JEFF HECHT

Laser printers for mainframes are nothing new, but advances in semiconductor lasers and copier technology have brought them to the threshold of the micro-

the threshold of the microcomputer world.

mainting

Printing LASER REAM

copier technology into the basis of an eight-page-per-minute laser printer "engine." Complete laser printers using this engine may sell for as little as \$3,000.

Personal computer makers are excited by the prospect of affordable printers that can handle both graphics and text, operate at a reasonable speed, and produce clean, photocopy-quality output. Apple is already planning to offer a laser printer for its Macintosh and Lisa II systems. Industry sources say that Hewlett-Packard has similar plans and that IBM is considering laser printers for its personal computers. But whatever the label on the outside, many of the first generation of inexpensive laser printers will be made by Canon, which is concentrating on building the optics and then selling these printer engines in quantity to computer makers. These companies would then add their own electronic interfaces and software. However, industry sources say that other Japanese copier makers, including Ricoh and Minolta, are working on their own laser printers.

How Laser Printers Work

Although laser printers are not easy to build, the basic idea behind them is simple. A laser beam is focused to a tiny spot that scans repeatedly along the length of a light-sensitive electrostatic material. The scanning beam is turned on and off, creating a pattern on the drum that can be transferred to paper. The process is similar to that used in a copier.

The laser "writes" does on the drum, so, strictly speaking, a laser printer is a nonimpact dot matrix printer. However, laser printer, as aspecer 2 flot 10 eVed on the printer is a specer 2 flot 10 eVed of the printer is an appear 2 flot 10 eVed of the printer. Higher dot density produces much more largicle very graphics and much more largicle very graphics. Higher dot density and the product of the printer is the product of the printer is the printer in the printer in the printer in the printer is the printer in the printer in the printer in the printer in the printer is the printer in the printer in

higher dot densities, but the text still looks boxy, and curved or slanted lines tend to look jagged. The output quality of laser printers at 180 dots per inch is not dramatically better than that, but at 300 does per inch the dots become practically invisible. The output looks like a clean photocopy of an original page. Higher densities look even better, and Canon claims that the model LBP-5/480 laser printer, which

packs 480 dots into an inch, can generate "typesetter-quality" documents. Higher dot densities also allow for a greater choice of typefaces. The lower the density, the more care must be taken in picking typefaces, especially italics. The

Laser printer hardware

reproduces a digital bit map, an array of dark and light spots.

jaggedness of slanted lines at low dot densities is visible and annoying. At higher dot densities, lines become much smoother and a broader selection of type styles is available.

Increasing dot density does tend to slow down speed, simply because the printer must produce more does. High-seed laser printers, with powerful lasers and sensitive drums, take only a few humandershot of a microaccound to write a dot, but slower models using less expensive aleasen and drums take closer to a micro-second per dot. Thus, a printer that just over half the speed of a similar model with 500 does-per-indo output, because the slower model must print almost twice as many does per unit area.

The speed of an individual printer varies depending on what is being printed and how it is encoded. Laser printer hardware, like that of a video screen, reproduces a digital bit map, an array of dark and light spots. In theory, the bit map could be genenated directly by the computer, but this is impancical because of the high resolution of the printed page. At the modest resolution of 240 dots per inch in both directions, and 8%-by-1-linch page contains 5.4 million bits. A 19200-based R8-222 link would take nearly 5 minutes to traval those bits one by one. Even a 2-megabyteper-second Centroins 8-bit praidler face would be a bottleneck for an eightpage-per-minute laser printer.

The solution is to encode both text and graphics for transmission to the printer. where a special interface converts the codes into a bit map without slowing down the main processor. Text is transmitted as standard ASCII characters that can be readily converted to their dot matrix representations. Graphics can be encoded using techniques such as instructions to draw a line between two specified points or to fill in a certain area with shading. Transmitting and decoding graphics generally take longer than the same operations for text, so generally the fastest rated laser printer outputs are for text only. The addition of decoding electronics and software boosts the price of a laser printer well above that of the bare laser and optical system.

Evolution of Laser Printers

Early laser printers were expensive high-speed systems designed for the highvolume printing of material such as insurance and bank statements. Descendents of those systems remain on the market today. Although their performance has improved, they still carry 6-figure price tags. (They now generate vast quantities of personalized junk mail as well as financial statements.)

A few years after IBM, Xerox, and Sismens put out their first high-speed laser printers, other companies came out with models that were slower—although fast compared with mechanical printers. Hewlett-Packard stresses the versatility of its HP 2680 Laser Printing System, introduced in 1980, which prints 43 pages per minute at a resolution of 180 dots per inch. It offers several typefaces, including some for foreign languages. Company logos can be put into software and called up when needed. Graphics capabilities, including the printing of bar-code symbols, are optional and limit the printer to slower speeds. The output is readable and generally attractive, although the limited resolution makes light table type and some

slanted lines appear jagged. Newer technology, including holographic scanning optics, is used in the 28page-per-minute Holoscan printer produced by the General Optronics Corporation, of Edison, New Jersey. The 300-dotper-inch printer costs \$12,000 and requires a \$2,000 interface for character generation. Over 100 such systems have been sold, says Ray Newstead of General Optronics, mostly to defense contractors and government agencies that produce many reports. Just coming on the market is a \$4,000 module that will allow the printer to produce graphics and is likely to broaden the printer's applications.

Sophisticated graphic capabilities are the main attraction of other, even slower laser printers. Quality Micro Systems, Inc., of Mobile, Alabama, offers the Lasergrafix 1200 printer that prints 12 pages per minute with 300-dot-per-inch resolution. Much of the system's cost lies

in its sophisticated internal bit-mapping computer that creates graphics for plotting and computer-aided design. The results are attractive and, like the text produced by the General Optronics printer, show few traces of their dot matrix origins. Graphics are also emphasized in the LGP-

The past few years have brought great increases in the power and reliability of semiconductor lasers

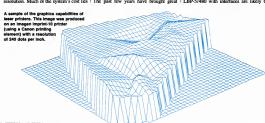
I Laser Graphics Printer from Symbolics, Inc., in Chatsworth, California. This is a desktop model that prints ten pages per minute with a horizontal resolution of 480 dots per inch and a vertical resolution of 240 dots per inch. Both the Quality Micro Systems and Symbolics printers cost 525,000.

The key developments that have pushed the price of laser printers dramatically downward are births of semiconductor laser and the inexpensive photocopiers. The past few years have brought great

increases in the power and reliability of semiconductor lasers. Semiconductor lasers are replacing bellsy gas lasers used in earlier laster printers because, among other advantages, they can be modulated directal modulators. Meanwhile, copier performance has improved as prices have dropped, and the smelly, coated-upper copiers that were common in the days of the first laster printers have been consigned to the scrap least.

Canon's First Salvo

The Symbolics system mentioned above is built around a first-generation semiconductor laser from Canon. The Japanese company made the scanning and printing components and sold them in bulk to other companies that added the electronics and software needed to make them run. After selling some 10,000 such printing units, Canon announced two new models last year. One is the LBP-5/480, which prints five pages per minute at a resolution of 480 dots per inch, both horizontally and vertically. The price is \$5,800 each in lots of ten or more, and, like the prices of other Canon models, that doesn't include interface software or hardware. Prices for complete versions of the LBP-5/480 with interfaces are likely to



run from \$15,000 to \$20,000.

The hottest thing on the market is Canon's other model, the LBP-CX. Its sales literature bills it as "the only laserbeam printer that fits on a deak wide your personal computer." It can produce eight pages per minute with a resolution of either 240 or 300 dots per inch. Measuring a mere 18.7 by 16.3 by 11.4 inches, it weights 34 pounds, comparable to most letter quality printers for personal computers. Like Canon's other models, it requires a certal video input, and it's marketed to provide the needed interfaces, and sell complete printers to users.

The biggest news about the LBP-CX is its price. Canon in at talking for the record, but the laser-industry trade magine. Lasers & Applications reports that large quantities can be bought for around \$1,000 each. The need for interfaces and marketing expenses will push the end-user price up to around \$3,000, or more, the depending on the graphics capabilities. That's still less than 1 percent of the list price of the IBM 300, and in the ballpurk.

for personal computers. The unit's low price stems largely from the use of technology developed for Canon's personal copiers, which retail for \$1,200. Canon put the components that require regular maintenance-the toner, electrostatic drum, developer, and other image-transfer components-into a disposable cartridge. After about 2,000 copies, the user replaces the cartridge with a new one that retails for \$65-or \$3.25 a copy. This approach aims to avoid a prevalent problem with copiers: the lack of preventive maintenance. Canon also uses special optics to compensate for minor flaws in the rotating polygonal mirror that scans the laser beam across the drumallowing the use of mass-produced scanning mirrors much cheaper than those of other laser printers.

Who Needs Laser Printers?

At \$3,000 each, these laser printers aren't the answer to everyone's printing needs. However, they do promise to solve serious problems for two growing groups of users: those who need quality printed graphics and those who need large quantities of correspondence-quality text.

The advent of windowing software is another example of the growing importance of graphics. Graphics make computers friendlier, particularly for new users and those more concerned with their jobs than with computers. For example, graphics are a major element of Apple's Macintosh. Laser printers offer a good combination of the printers of the printer

At \$3,000 each, these laser printers aren't the answer to everyone's printing

nation of quality and speed for printing graphics.

Users who demand high-quality text output have long been forced to put up with letter quality printers that typically lake 1 to 4 minutes to print saingle-spaced page. Mechanical dot matrix printers could do the job faster, but many users could do the job faster, but many users from laser printers could saistly many more of those users—particularly those generating reports or other long documents, who value high speed more than users who just write a few letters do.

Prices of laser printers won't keep dropping forever, too many precision optical and mechanical components are needed for prices to said another factor of ten. Competing technologies also exist. Some observers see good prospects for thermal printers, which produce decembers of the printers, which produce decembers of the printers, which produce described to the printers, which produce the printers which produce the printers which produce the printers which produce the printers which produce the printers, which produce looking at this printers, which produce the printers, which produce the printers which printers which produce the printers which produce the printers which printer

good output at low cost but run slowly.

Ink jet printers do have a clear advantage in producing multicolor output. which is a weak point for laser printers. Xerox offers the model 6500 Color Graphics Printer, which is essentially a laser scanner bolted onto a color conier. However, the system's resolution is only 100 dots per inch, its speed is just 3.2 pages per minute, and its price is somewhere over \$30,000. Like a color copier, it requires three passes and three separate colored toners to produce a full-color print. Even the inexpensive Canon printer can produce colors other than black if cartridges with colored toners are used, but multicolored graphics are beyond it.

The reliability of inexpensive laser printers could be a problem if, like office copiers, they are overworked and undermaintained. Ray Newstead of General Optronics recalls one potential customer who calculated laser-printer capacity by multiplying its pages per minute by 60 minutes per hour and 24 hours a day. That way he came up with a figure of a million pages a month, far beyond the 30,000 to 100,000 pages the General Optronics printer is designed to produce. Such overwork, combined with neglected maintenance, is a major reason that the sparklingclean copies produced effortlessly in sales demonstrations are rarely matched in fulltime use. Theoretically, Canon's replaceable cartridge should help cure the maintenance problem, but its ultimate test will come in the field

Even if problems do emerge, the new generation of laser printers should find a niche in the personal computer world. Their combination of speed, graphics, versatility, and high-quality output will justify their price for many users.

Jeff Hecht is a contributing editor of Lasers and Applications, a laser-industry trade magazine. He is the co-author of Laser: Supertool of the 1980s. An engineer by training, he has written for High Technology, Omni, and New Scientist, among others.



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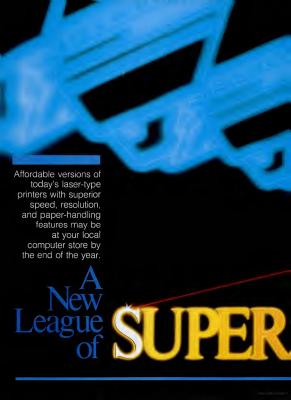


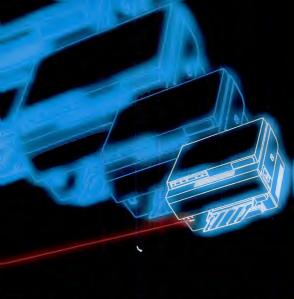
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PRINTERS

HARDWARE / JOHN REAVES

tace it your printer, whatever the type, model number, and sticker price, is probably the most primitive part of your whole computer system. The thing clatters and jerks and thumps, or buzzes like a dental nightmare, and the output is probably crude. If you have a lot of printing to do the beast may rock for bours, rinding sawa line after line.

For a long time, hard-copy output has lagged behind the advances of other PC capabilities. Memory, processing power, video graphics, and input devices have all improved in quality at termendous rate, and their cost has been coming down. Unfortunately, printers and other graphic outtput devices have evolved more slowly.

There's a good reason for the sluggish pace. Conventional impact printers require electromechanical parts to make a hard-copy impression. And it's a recoghistory that the more electromechanical components involved in a particular technology (as opposed to purely electronic components), the more slowly the price/ performance ratio improves.

Copier Technology

The future holds better things for printers, though, in the form of high-speed, high-resolution nonimpact printers. These "super printers" have been around since the mid-1970 but they 've luxed in the wings as far as microcomputers are concerned. Because these printers use electrophotographic technology, they avoid much of the noisy mechanical nonsense of conventional impact printers, while doing

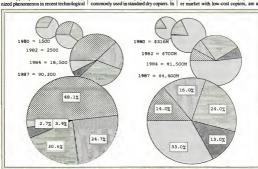
a better job of paper-handling.

Most of the super printers, particularly
the glamorous laser printers, are closely
related to the xerographic technology

fact, many are being built of the same components used in popular copier models, and several combine copier and printer functions. Super printers also share many basic operating characteristics with office copiers. These include high-resolution graphics capability, cut-sheet paper handling, and a relatively low noise level, plus a page-per-minute output that puts the fasters dor matrix ordiners to sharme.

What's the catch? Primarily price. If you went out to purchase such a system today, you would find prices ranging from \$14,000 for low-end systems (10 pages per minute) to a stratospheric \$400,000 for the high-end systems (100 pages per minute)

But make no doubt about it: these printers represent the wave of the future. Prices are coming down; a number of Japanese companies, which are shaking up the copier market with low-cost copiers, are also



These pie charts were produced by Canon's laser "print engine," which is now being sold to OEM's for packaging and sale. No one is saying how much the printers will ultimately cost, but rumor has it that prices will be around \$3,000.

SUPER PRINTERS

using the same expertise to produce super printers.

In fact, Canon has publicly shown the "engine" of a low-cost laser printer using the company's personal copier cartridge technology. At a speed of 8 pages per minute, this remarkable engine cranks out text equal or superior to the best daisy wheel printers, plus graphics and halftones.

Canon is currently selling the systems without interfaces to the fabled OEMs (Original Equipment Manufacturers) for packaging and sale. Neither Canon nor the OEMs are saying how much it will ultimately cost, but the scuttlebutt is the prices will be around \$3,000. And the rumor mongers also claim that the OEMdistributed offspring will be ready for sale as early as June of this year.

A number of large U.S. personal computer manufacturers have jumped on the wagon with plans to develop or market printers to run with their own machines.

How Super Are They?

Super printers can outdo conventional impact printers in these time-saving ways.

A super printer may use one of several technologies, including laser and ion deposition. In spite of some difference in principles, their features are simlar enough to be treated as a family. Many of these capabilities depend on the particular software and hardware interfaces available.

Speed

Super printers come in a wide range of speeds, but all are fast-so fast that the conventional way of comparing speeds between printers in the PC field (characters per second) is not really applicable. Instead, super printers are usually rated in lines per minute (lpm) or pages per minute. If we assume that an average line is 60 characters long, then 10 characters per second is roughly the same as 10 lpm (ignoring differences in line-advance speeds). Super printers start at around 1,000 lpm. The real speed demons can do up to 26,000 lpm. That's dazzling compared to a top speed of approximately 50 lpm for a daisy wheel printer, or 200 lpm for a mid-range dot matrix printer.

If you are document-oriented, it might be easier to think in terms of pages per minute. The range for a super printer is between 10 and 120 full 8½-by-11 pages produced every minute. That's 10 to 120 times as fast as the fastest daisy wheel printer.

Resolution

Many super printers can pack 90,000 pixels in a square inch, as compared to about 18,000 for a typical dot-matrix printer in graphics mode. But they do it running at full speed, whereas most dot matrix printers do their fastest work in a lower-resolution text mode. When printing graphics with a super printer, you'll notice it's superiority to a dot matrix printer in the fineness of lines, the solid blacks, the smooth edges, and the relative absence of "stair-stepping". When printing text, the super printer forms characters of dots or pixels, the same as dot-matrix printers. But the tiny size and close spacing of the dots makes the characters very close in appearance to the characters formed by a daisy wheel printer. Particularly with the higher-resolution systems, you need a jeweler's eye to tell the difference. It's not quite typeset quality, but for most purposes-including formal correspondence and even some publishing projects-the results are admirable.

Graphics Capability

This is the payoff for a lot of applications. First, most super printers offer multiple fonts on a single page. This makes them wonderful for reports, manuals, and a wide range of other semifancy documents. Second, many allow you (depending on the software) to mix graphics and text on the same page, including such niceties as halfore screens and shading, and putting any character, figure, or image anywhere on the page. You can even digitize a photograph (using a video camera, digitizing interface, and appropriate software) and print it in halflomes. This is great for charts, forms, reports, maps, models, logos, and other fancy graphics.

Paper-Handling and Noise

The super printer handles paper like a copier in cut sheets, automatically leeding paper from a cassette, on plain standard-sized paper (letter or legal). If you want a wide printout, many models will automatically turn the pape image side-ways for a "landscape" orientation. One of the most agreeable aspects of the technology is that there are no pounding print hammers; the noise is similar to a standard office copies.

Don't underestimate the advantages of these features. There are not may not of these features. There are not may working situations where a quieter printer will fail to improve productivity of the working environment. Plus, with a conventional printer, a great deal of the working environment. Plus, with a testing the special printer, and the printer and the special printer and the printer and th

Hewlett-Packard already has a number of super printing systems available, and Apple is making noises about a laser printer for the new Lisa and Macintosh systems in the \$5,000 range.

What all this means is that these new super printers will be price-competitive with a wide range of conventional printer types: high-end daisy wheel printers, fast multi-mode printers, line printers, highquality plotters, and so on. Since the performance specifications of the super printers are superior to virtually any other printer type in this price range, they should demolish the competition handily.

They should start appearing on computer store shelves during 1984, looking like nothing so much as desktop copiers. They'll come supplied with personal computer interfaces and software, and they will be packaged under familiar names.

Who Needs It?

Super printers may always be more expensive than your dot matrix or 20 CPS daisy wheel, and therefore they will hardly be worth the expense for a few letters or program listings. Where they will find their place is in the business and office automation environment, as well as in professional, engineering, scientific, publishing, and other fields that have special requirements for hard-copy output.

In all of these areas of computer-aided endeavor, the trend is toward flexible high-quality graphics and text combinations, including form and image processing, and toward networks of personal computer workstations that share peripherals, hard disks, and other systems components. These high-tech, high-volume environments will soon become the domain of super printers.

Does it make sense to have a printer that costs as much as the rest of your system? Definitely, in some cases. If your printing needs are in one of the following functional areas, you should take a serious look at this new generation of printers:

Word processing and in-house publishing. Super printers can intermix a variety of fonts and character sizes on one page; mix text and graphics, including charts, logos, and signatures; print on a variety of cut-sheet paper stocks, preprinted company letterheads, and transparency materi-

als: and merge forms with variable data. Business graphics. Super printers can produce high-resolution pie charts, bar charts, and line-charts and business forms with halftones, circles, two-dimensional plotting, highlighting, and condensing. Industrial graphics. Super printers can

Interfaces for wordprocessing applications will come first

generate characters with variable width, height, and orientation; print in either "landscape" or "portrait" orientation; produce compressed print, OCR characters, barcodes; and do line and box drawing, multiple forms overlay, and reverse image print.

Scientific, analytical, and CAD/CAM applications. Super printers can emulate plotters, vector graphics, and other graphics devices and standards: hit-man a full page at a time; emulate vector graphics; and produce scientific notation, special characters, and high-resolution diagrams and schematics.

High-volume line printing. Super printers can provide high-quality data output at speeds equal to or greater than line printers on standard-size cut-sheet paper, which is easier to handle and store.

Printing directly from a CRT screen. Super printers can be linked to CRT terminals through an electronic interface, so a screen image can be dumped to the printer and displayed on ordinary paper.

Electronic mail. Link a super printer to a document scanner over a local area network or high-speed modem and you have a high-quality electronic mail system that can produce hard-copy output.

If you consider buying a laser or other

super printer, be prepared to do some research and to wait for the right combination of hardware and software.

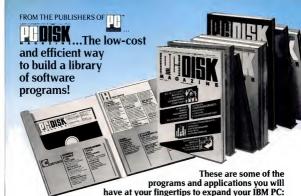
Many super printers offer an RS-232 serial interface or Centronics-compatible parallel interface, either of which is available for PCs, and some offer Oume/Diablo emulations. But it will take more than a simple hookup to fully utilize the super printer's capabilities. With only ASCIIcharacter output, which is sufficient for any letter printer, many capabilities of a laser-type printer will go to waste. Even a simple application, such as printing a memo with multiple fonts on the same line, may be impossible with your present word processing software.

For these new printers, software is going to be as crucial as hardware. The manufacturers of printers at the lower end of the price-performance spectrum are already thinking about the problem of interfacing with micros. Interfaces for word processing applications will come first, since these are relatively simple. Next will come graphics interfaces that emulate popular graphics devices, such as

the HP plotters or Tektronix displays. What will really open the door to the brave new world is integrated packages that allow you to mix text and graphics, with the screen's display able to match everything you can print out. These functions are in the works. In fact they're available now with the Xerox Star system (for about \$60,000) or with Apple's Lisa/ Macintosh system, which is why a laser printer is such a natural peripheral for these systems. PC software designers won't be long in redesigning their graphics interfaces to take advantage of the new

printer's high-resolution canabilities. Laser-type printers will probably soon dominate the business and professional printer market. In their quiet way, they may be as revolutionary as personal comnuters were in data processing.

John Reaves is a writer who specializes in



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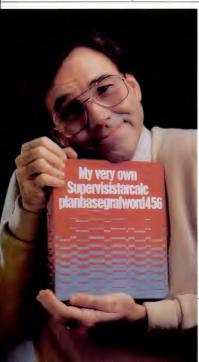
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Building An Orderly Hard Disk

If you can envision your file system as an office building and the function keys as elevators, this guide will save you headaches when organizing a hard disk using DOS 2.0 or 2.1.

inding files on a hard disk-based computer system can sometimes be very difficult. Have you ever tried to find your way around a strange place without directions? Locating files on a hard disk can be similarly inconvenient and frustrating.

When you've loaded many files and programs in multiple directories, locating just one of the files can become tedious. This can be an even bigger problem if someone else has loaded the dan. Directories and subdirectories are supposed to help organize your files, but directory names may only give you the slightest hint as to their contents.

Memus can help organize a hard disk in the same way that the directory board in the lobby helps you find your way in a large office building. A memu of selections and directions at each directory or butchirectory level can make your hard disk esiier to use by guiding you to your destinaion. To really beef up the system, you can assign the function keys to act like the elevators of an office building, tenspour you quickly and easily from one directory level to another. Planning the Structure

The analogy of the office building can bely you design your system. A directory level in the filing system can be seen as a separate floor in the building and each subdirectory can be seen as one of the offices. Each level will have a menu describing exactly what resides there and a main menu will be available in the root directory. The main menu will be available in the root directory. The main menu will point to each of the other menus, which point to specific applications or programs. Help serceus as an exceed users are been to assist interperior of the programs of the programs of the programs.

You can use DOS keyboard reassignments to assign strings to the function keys. Pressing the keys will then display menus for the current directory, the previous directory, or the root directory. The function keys can also call help screens that you design and DOS commands from any level.

In designing a menu system that is dependent on the function keys, you must come up with key assignments that are consistent at all directory levels. For instance, each level will contain a file called MENU.TXT; you can display this

file by pressing a function key that issues a display command. No matter which level you are in, the menu file for that level will be displayed. Each level will also contain a help file called HELP.TXT that you can display by pressing another function key.

The function keys execute batch files that are stored in the root directory. Some of these batch files may transfer you to different levels. For instance, pressing the Main Menu function key will execute a batch file called MM.BAT that changes directories to the root level, clears the screen, and then displays the menu for the root level.

The menus help you climb through the directory levels. For instance, the main menu may contain four selections, each of which branches you line a specific you line a specific you line a specific you spreadheets, games, or programming languages. After making a selection, you are transferred into a directory level on the specific selections. If the application you chose you programming languages, the selections in the back SIGC. Pascal, and FOR-midth of the programming languages, the selections in the back SIGC. Pascal, and FOR-midth of the programming languages and FOR-midth of the programming languages.

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ORDERLY HARD DISK

TRAN. If you chose word processing, they might be business documents, personal documents, and memos.

Each selection on a menu has a corresponding number that sho the name of a batch file. The batch file transfers you to the appropriate directory level and either displays a menu or starts the chosen application. Pressing the 1 key when a menu is displayed executes a batch file called 1.BAT. Each directory level that contains a menu will also contain a set of these numbered batch files corresponding to the menu selections.

All the DOS commands and some of the batch files connected to the function keys will be stored in the root directory, which is used only to hold this material. All other program files and data files will be stored in higher levels to save disk Soace.

A PATH command that tells the operating system to look first for a command in the current directory will be issued in the startup AUTOENEC file. If no command is found there, the system will then look in the root directory. This gives commands and batch files in the current directory precedence over commands and batch files in the root directory.

The importance of this lies in the menu selection numbers. Each directory level will have batch files corresponding to the selections on the menu. When you press the 1 key, it is important that the batch file in the current directory is executed before the batch file in other levels.

On the other hand, a batch file connected to a function key and used to display the main menu is accessible at all directory levels, so this batch file resides only in the root directory. If you wanted to override this batch file, you would simply place a revised copy of it in the current directory.

The startup AUTOEXEC batch file also sets the system prompt. If you type

PROMPT \$p\$g

in the batch file, the prompt will always display the path of the current directory to

help you keep track of where you are in the filing system.

Building the System

To design a filing system to suit your own needs, you must consider the types of applications you will be running. A good place to start is with the main menu. You should organize your software into specific groups and then create a menu that lists each group. Each of the categories will branch you to another directory level and display a menu.

The following key assignments will be used to automate the filing system:

Alt-F1 HELP.
Alt-F2 MENU. Display Current
Menu
Alt-F3 MAINMENU. Return user

to root and display menu Alt-F4 PREVIOUS MENU.

Display previous menu

The function keys are combined with the
Alt key because the DOS editing functions

Directories and subdirectories are supposed to help organize your files, but directory names may only hint at their contents.

are normally assigned to the unshifted function keys.

You can create the menu with a program editor such as EDLIN or directly from the keyboard using the COPY CON command. Since the menu file will be displayed on the screen, it must be a plain

Some word processors do not create these types of files. Use COPY CON to create the menu and then EDLIN to cor-

ASCII text file

todoy



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rect or modify the file. You can create a skeleton menu that you can copy to each of the directory levels and modify to serve as the menu for that level.

After you finish the main menu, you will have to create corresponding directories for each of the selections on the menu and numbered hatch files to transfer you to

DEMONSTRATION DISK

the appropriate selections. The root level contains the main menu, and branching from it are directories corresponding to each selection on the main menu. Each directory has its own menu with other

keys is to return you to either a menu or the root directory upon exiting from an application. For instance, if you have been

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directories branching from it. One of the main uses for the function

You can create the menu with a program editor such as EDLIN or directly from the keyboard using the COPY CON command.

using a word processor, you will still be in the word processing directory after exiting from the word processing program. Pressing Alt-F3 will immediately return you to the root level and display a familiar menu.

Creating Directories

MKDIR OTHER

To create the four directories that correspond to the main menu selections, type in the following commands while in the root level:

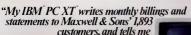
MKDIR BUSINESS (create the business software directory) MKDIR PERSNL (create the personal software directory) MKDTR GAMES (create the games

for miscellaneous software)

The next step is to create the four batch

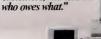
software directory)

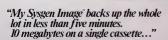
(create a directory



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ORDERLY HARD DISK

files that transfer you to the directories, the COPY CON command is the fastest way to do this. To create the file for selection 1 of the main menu, type the following:

COPY CON: 1 BAT ECHO OFF

(turn display of commands off)

CHDIR BUSINESS (change directories to BUSINESS) (clear the screen) TYPE MENU, TXT (display the

menu for this

level) <F6><Return>

Pressing the F6 key and then the Return key writes the file to the disk. Repeat this process for each of the other files, replacing 1.BAT with 2.BAT, 3.BAT, and 4.BAT respectively and replacing BUSI-NESS with PERSNI., GAMES, and OTHER for each of the files. The main menu is now automated, and now you can create menus in each of the four subdirectories. Copy the skeleton menus you created earlier to each subdirectory, renaming them MENU.TXT. After the text has been added to these menus, create corresponding directories and batch files for each of the selections on these menus

Next, you must create the key assignments that will automate the entire system. (See the sidebar "Creating Keyboard

Tying batch files to key assignments saves room in the key assignment buffer.

Assignments" for a special process used to assign the function keys.) The batch files for the function keys should be entered in the root directory. Type the following files:

COPY CON: HELP. BAT ECHO OFF

TYPE HELP, TXT

ECHO OFF

CLS

CLS

(turn display of commands off) (clear screen)

(display help file) <F6> <Return>

TYPE MENU, TXT <F6> <Return>

COPY CON: MM. BAT ECHO OFF (change CD/ directory to CLS root level)

TYPE MENU. TXT (display main <F6> <Return> menu)

COPY CON: PM . BAT ECHO OFF CD . . CLS. (go back one

TYPE MENU. TXT level) <F6> <Return> These four key assignments are just an

example of what is possible. One advantage of tying batch files to key assignments is that it saves room in the key assignment buffer, which is limited to 128 characters. although alterations are available to expand it. (See "How Many Angels Can Dance on a Function Kev" in "User to User" PC, Volume 2 Number 4).

The assignments here total 31 characters, so there's still some room left in the buffer. You may want to assign certain DOS commands to the keys, such as FOR-

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ORDERLY HARD DISK

MAT A:/S or DIR | SORT/+26 (sort directory by date). One of the key assignments could even display a file listing all the key assignments. If you want to assign

many keys, have the keys call batch files that reside in the root directory level. These batch files would have two- or three-character file names in order to save The Key

much-needed space in the key assignment huffers

The key to making it all work is the AUTOEXEC BAT file, which will set the directory path and the system prompt and assign the keys. Enter the following in the root level:

COPY CON-AUTOEXEC BAT ECHO OFF DATE

TIME PROMPTSp\$g (set prompt to

display path) TYPE ASSIGN.CDS (keyboard assignments)

PATH \ CLS

TYPE MENU. TXT <F6> <return>

To finish the system, create the rest of the menus in the applications directories. Enter the appropriate batch files and add

The AUTOEXEC BAT file sets the directory path and the system prompt.

your software applications to a specific directory.

One nice thing about this file system is that it can grow outward from the main menu. You can always add a new major software group to the main menu, and if your system has two or more users you can add separate directory pathways for every user, each with its own main menu.

Another big advantage of the system is that the normal DOS prompt is always available to you if you want it. You have full control over your system as if the menus were not there, although they are always available when you need them. Just press Alt-F3.



terminal. Or, choose VT100. VT102 or VT52 capability. And, what's more, you get owerful ASCII and binary file transfer, including an "error-free" mode. SMARTERM features include full keyboard emulation, multiple setup of

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Creating Keyboard Assignments

You can make your life easier by assigning strings to the function keys.

Creating keyboard assignments for DOS 2.0 and 2.1 involves the following process:

 Create a file of the control sequences for changing key assignments.

Create a CONFIG.SYS file containing the ANSI.SYS keyboard driver.

Reboot the system to load the new driver.

 Display the assignment file on the screen to assign the keys.
 The first of these steps—creating the

file—is the most complex. It will be helpful for you to refer to Section 13 of the DOS manual, which describes the keyboard reassignment feature. Page 13-10 gives an example of assigning the DIR command to the F10 key with the sequence

The 0;68 indicates the location of the F10 key on the keyboard, the 0 indicates that the key is an extended key (see page G-6 of the BASIC manual) and the 13p is a carriage return.

The tricky part is getting the essage code into the file without actually escaping while you're doing it. You can't be rocess described below uses a dummy character in place of the escape exoc, and then uses DEBUG to replace the dummy code with the escape code. After you've captured the elusive code using within method, you can use EDLIN to make multiple copies of the original line for other keyboard assignments.

Create a file called ASSIGN.CDS. The dummy character will be the asterisk. You need only the first part of the string at this point. Enter:

COPY CON: ASSIGN.CDS

*[0;

<F6> <Return>
Now use DEBUG to fix the file, and

don't worry if you've never used DEBUG—this will be easy. Type:

DEBUG ASSIGN. CDS

When a dash (—), the Debug prompt, appears, type D for Dump to see a listing

of the file. The first line should look something like this: 0952:0100 2a 5b 30 3b 00 00

00 00 00 00 00 00 00 00 *[0:

00 00 00 00 00 00 00 00 00 00

The address is shown on the left. (My address was 9052-0100; yours may be different. This is followed by the hex numbers that represent the ASCII listing on the far right. The asterisk (which is hex code 2a) must be replaced with 1b, the escape code. Type E and the address shown on the left. In this case, you would type:

E0952:0100

You will now be able to edit the line. The asterisk character that you want to change appears first and the cursor appears next to it. Type 1b, press the Return key, type W to write the changes to disk, and then type 0 to exit.

The next step is to get into EDLIN

and finish the file. Type:

EDLIN ASSIGN.CDS

For 10 copies of the first line, enter:

1. 1. 2. 10c

If you list the file at this point, you will notice that there are 11 lines of escape codes. The escape code in each line is now 1. At this stage you only have to add the rest of the string to each line. You can use the right arrow key to copy from the template, which is the line above the one being edited. Here's what

the first four lines should look like:

[[0;104;''HELP'';13p
[[0;105;''MENU'';13p
[[0;106;''MM'';13p
[[0;107;''PM'';13p

You may use the remaining lines for your own strings. The extended codes for the function keys are listed on page G-6 of the BASIC manual. Enter 13p at the end of each string only if you want a carriage return to be executed when you press the assigned function key. When finished, hit E to exit and save the file.

The remaining steps are much simpler. Create the CONFIG.SYS file by typing the following:

COPY CON: CONFIG. SYS DEVICE=ANSI. SYS

Then press F6 and Return. You will have to reboot to load the new driver. If you created the AUTOEXEC file shown in the main text, the ASSIGN.CDS file will be displayed on the screen and the keys will be assigned.—T.S.

1.2.3

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A Trio of Mailing List Managers

ailing list managers can perform a variety of functions tanging from printing address labels and Rodock cards to prepare complex mail-merge data files. The program you choose will depend on your individual needs and budger. Obviously, the medium-stred company with comiderable medium-stred company with comiderable of program than the individual contending with the complexities of foreign address labels. The three packages reviewed here, Multing List I, PCMML, and Canalist. have strong selling points, but each was designed for different purposes.

Mailing List for Beginners

Mailing List I, from Alphanetics Softwer, in Foresville, California, cornes on a single copy-protected disk and is completely menu-driven. A backup copy is available for \$10. The program is easy to use a continuous control of the control of the control of the control of the MAND.CCM and BASICA.COM onto your system disk and menu options are proposed to the control of the control of the Albert Belg is validable by ploone. In fact, the more experienced user may find the menu to be to user-friendly.

The actual data entry process is quick and easy, Information can be transferred from one record to another by typing an asterisk (*) in the appropriate field. Up to a compared to the control of the con

Before sending out your next mass mailing, look at the options offered by Mailing List I, PCMAIL, and CataList. One of these programs may have you laughing all the way to the post office.

phone numbers, attention notices (for instance, ATTN: Mr. Marlowe), and special purpose one-character identification codes. The attention field can also be used alternatively as a date field or as whatever

else you might need it for. The start-up menu has six options: add new entries, change or delete entries, print labels or a master list of addresses, create a new mailing list of addresses, create a new mailing list disk file, change data files, or exit to DOS. On the screen used for entering data, the monitor displays date, time, file name, and entry record number. On the first field (called the sort field or key) you enter a person's surname or the complete name of a company, which is automatically capitalized in that field. You can edit or delete records while scanning through the entries on the sort field or record number.

Mailing List I will print mailing labels of selected addresses or give you a listing of all information in the mailing list file. Sorting by ascending or descending alphanumeric order is automatically done on the sort key before labels are printed. You may then re-sort the records by name, first or second address line, city, state, zip code, attention, or identification code fields. A label-screening menu lets you indicate value ranges for selection of addresses for printing based on the sort key, zip code, address, attention, and identification codes. You can also print the new entries only, choose to print from one to nine labels for each entry, or suppress the attention field altogether.

If sorting is done by zip code, Mailing
List I will automatically print an additional
label indicating the zip code and number
of labels printed—a useful feature for bulk
mailines.

Mailing List I is a good program for those who want a simple, no-frills, wellorganized mailing system.

A Lot of Label

A Lot of Laber

PCMAIL, from Richware, in Tigard,

Oregon, gives you more for less, but it is
slightly harder to use. The program comes

on a single disk, which is not copy-protected.

You use function keys FI through F3 to bring up the five work screens; they look complicated, but they are easy to use. The first screen, which is for name and address maintenance, allows you to add, change, delete the record, or display the next entry. The Tab and Shift-Tab keys, which take you back and forth between the different fields of the work screen, make correcfields of the work screen, make correc-

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MAILING LISTS

tions easy. PCMAIL lets you store a great deal of information in each record and put most of it on a mailing label. It provides fields for two different names, three street addresses, city, state, zip code (9 digit), work and home phone numbers, and a comment line. The catch is that you must use the somewhat unconventional 17/16inch by 31/2-inch mailing labels. PCMAIL will print eight 34-character lines on each label. For some mailing list applications. like foreign mailings, institutional addresses, and special label messages, this is an important feature that is usually found only in far more expensive list manager programs.

Each mailing list has two separate disk files. The first file holds address records. the second, "name type" designations. When you enter a new record in PCMAIL, you select one or more of 16 name-type categories, which you define. These identify specialized mailing lists within the master file. Selection of labels for printing is based on combinations of these nametype categories.

The second work screen produces either a printed mailing list of all names and addresses or a selected listing based on one or more of the name-type categories. A third screen prints address labels of selected records. These can be printed in zip code order, and, for bulk mailings, one extra label is printed displaying the zip code and the number of labels printed. You can print from one to nine labels for each name and a text pattern ensures alignment of labels in the printer. A fourth screen lets you record or modify the nametype categories used for selecting records in print runs.

A final work screen lets you select all records that will work with WordStar and MicroSoft's Word mail-merge software.

In its next version, PCMAIL will support production and maintenance of Rolodex cards. PCMAIL undates are provided free of charge to registered owners who return the original disk. PCMAIL will soon be part of a package that includes software for accounts receivable and

checkbook management. This program is a well-conceived, inexpensive mailing list manager that puts a great deal of information on one label. It has some minor problems; for instance, it does not give you a directory of your data files (you have to go to DOS to get the file names), but overall it's a good value for your money.

Large-Scale Business CataList, from Software Publishing

and Marketing, in La Jolla, California, costs five or six times more than the previous two mailing list managers and provides a more valuable mail-management system. It is designed for large-scale business mailings and offers tremendous flexibility.

Catalist can be used for invoicing "Ship-To/Bill-To" files and is equipped to handle foreign addresses, among other specialized mailing procedures. CataList will print both addresses and return addresses directly on envelopes. Labels can be printed in different type styles and Rolodex cards of various sizes may be printed in user-defined formats. Mailmerge data files produced from your mailing lists can be used with many of the most popular word processing programs. Under DOS 1.1, you get 1.734 entries per double-sided disk; with DOS 2.x you can get 1,948 entries per disk. But that's not all it can handle. CataList continues to work with additional data disks using the same

selection criteria. The CataList manual consists of more than 200 photocopied, letter-sized pages and comes in an impressive, suede-like three-ring binder. However, it serves as little more than a reference guide. Sample run-through tutorials of typical operations are sorely needed. Although working with CataList is not difficult, the package is complicated by dense language. For example, "Labels/envelopes or wordprocessing-interface diskette from a single master list entry? y/n" means "Do you want to print only one label?" The best

way to master CataList is one application

at a time

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Two double-sided disks are provided: 294,912 bytes in 19 files on one and 302,080 bytes in 22 files on the other. Catal.isr provides many bytes for your money, but switching disks is necessary for some operations. The disks are not copy-protected, and if you have a fairly simple mailing list procedure, it may be advantageous to transfer the essential disk files to a single disk.

In setting up the system you select printer type (12 brands are listed or you can choose the "other" category), make a count of the entries in the master list, tell Cottal.six which version of DOS you are using and whether or not you are using a hard disk. All these parameters can be saveed to disk. There are 14 options of mailing list applications that may be selected from the main menu, each with the multifurious functions of Catal.six are to carried to the control of the country of the multifurious functions of Catal.six are seven in small chunks.

Space is formatted on the screen for entry of name, three address lines, city, state, zip code (nine characters), phone number, comment, date, category codes (three characters), addresses title code, and an account number. Data may be duplicated from record to record by entering an asterisk in the appropriate field.

The aspecial user-defined categoy codes are three separate fields, each of which may contain any one of 80 alphanumeric characters. Categoy one for example, could divide the mailing list into customer age groups, category two could be used for renewal notices, and category three for identifying special accounts. Mailings may be based on selection of one or a combination of up to 20 category codes in each of the three categories. These codes may also be combined in 15 different ways by the logical operators "and" and "or".

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account-number field of seven digits may be used for any positive or negative numeric data, including financial information. The information in this field may be arithmetically summed in Caudia's report generation applications. Company names are sorted and tetrieved on the basis of the complete name, while individuals are sorted on the basis of the sumane.

An unusual feature of Contalar is its ability to deal with foreign addressed hilly to lead with foreign addressed postal codes. One or two-letter codes are provided in the namual for more than provided in the namual for more than the provided in the manual for more than the standard data-entry screen, and the foreign postal code, whether it is numeric or alphanumeric, is entered in the zip code field. When printing of, the mailing lade will be automatically reformanted to reflect the postal style used by each country.

CataList does not provide an option for browsing through the records or retrieving them by name, partial name, or entry number. Modification and deletion of the records is possible at this time. Records can also be marked for deletion; they can be retrieved as a group and reconsidered at a later time.

For sorting and selecting records, you can choose from a variety of methods, including user-defined sort fields, zip codes, category codes, or account numbers. You then decide which of the available fields to print and in what order to print them. The mailing list records are then output to screen or printed in order of name, or of name within zip code or city, or zip code within state. User-defined sorting can be done by using up to five sort fields from 21 fixed-length, predefined fields in ascending or descending order. You can also sort by using one to five fields of variable length, each defined as "from-to" values in addition to ascending or descending order. You may define up to 50 additional selection fields for printing, each with a range of acceptable values and a designation at the time of selection as to how each may be combined with other selection fields. For each field, you may choose up to 79 characters as a criterion for entry. You can also select one of six algebraic relationships (equal, not equal), and equal, not equal, select than, established than the control of the co

CataList offers great flexibility in printing mailing labels. You can even print addresses directly on envelopes. Because the label-printing module is not on the same disk as the data entry module, however, switching disks is necessary. Three run-parameter selection screens allow you to choose which addresses to print, the particular format and type style of the label, and other possibilities for customization. The first screen lets you select the number of labels across the page, number of label copies to print, placement of mailing address on the envelope, the category code or upper and lower limits of zip codes or account numbers to be printed, and user-defined selection criteria. A second screen allows you to enter a "wild card" or comment line that can be added to each label as it is being printed in any one par-

out as a log.

Before printing, a final menu screen appears that allows you to alter horizontal and vertical spacing between labels and

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MAILING LISTS

envelopes, or change the standard label ine width of 31 characters to accommedate, for example, extra-wide labels with expanded characters. Labels normally include three to five lines, but an additional line can be added if necessary. If a label should require six lines, CanaList then switches to printing eight lines per inch for that one label.

You can print two different sizes of Rolodes cards (2½ by 4 inches or 3 by 5 inches) using your mailing list data. These cards allow the same flexibility in sorting and record selection as the mailing lisbels. Address lists can also be printed using the Cardalsir mean option. Other options include output to screen or printer-abore visited address lists and display or print of the contents of the sorted-name index file.

The menu option for label printing can also be used to prepare ASCII files of selected mail list records for mail-merge programs of the following word processing systems: WordBun EastWriter, WordBun, WordBun, WordBund, SuperWriter, Spellbünder, Select, PowerText, Perfect Writer, MulliMate, and Executive Secretary. These files are saved to a separate, blank risk

CataList is eminently appropriate for businesses that do many special mailings. It takes time to master the program's many applications, but the manual is nicely organized and fairly easy to understand, and the manufacturer provides telephone

support.

Each of the three programs reviewed offers considerable value within its price range. The answer to which program is best suited to your needs, herefore, rests solely on what features you consider to be most important. Mailing List I offers a basic program that is exceptionally easy to openate. PCMAIL prints. large address labels and converts your mailing list data into word processor mail-nerge popurars. Caula List is designed to handle the most complex business mailings. It's your call



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WILLIAM K. HOWARD

message, Marshall
MacLuhan once observed. Is it true that the way
we present a message is as
important as the message
itself?
If you own or plan to buy

If you own or plan to buy a letter-quality printer instead of a dot matrix, you'd probably agree, although your reasoning may have been more direct: "People may have a hard time reading my reports if I get a dot matrix printer," or "I don't want anyone to know a computer wrote this."

If you want your letters, the property of the

If you want your letterquality message to be even more eloquent, consider stepping beyond the single typeface that came with your printer. For most letterquality printers, several dozen print wheels are available; for some, more than 100.

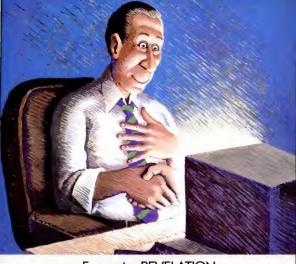
Carefully chosen print wheels can evoke a wide range of moods when combined with different papers, ribbons, and spacing. You can vary these factors to give your documents a subtly different look from the competition.

Too often, though, a PC owner simply sticks with one print wheel until twears out or breaks—which usually happens when the computer stores are closed and a report is due the next morning.

But there's no reason to wait for the worst, especially when variety is so inexpensive. Most print wheels cost from \$10 to \$20 library of a dozen lyris available for the print wheels to say the say and the print wheels to be a supplied to the print wheels are the say that the say the say that the say that the say that the say that the say the

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NEW FACE

two or three boxes of floppy disks. This article contains examples of some of the most popular typefaces. The major manufacturers—NEC, Diablo, Qume, and Brother—generally have their own versions of these styles, as well as some exclusive to their brands.

Some Diablo and Qume wheels are compatible with each other and with most of the daisy wheels produced by smaller printer companies, particularly the 96character plastic wheels arranged in word processing sequence.

Before ordering a print wheel, pay close attention to the special characters. The nonalphanumeric keys on a print wheel may be legal, math, engineering, or foreign-language symbols. The PC has no way of knowing which print wheel is on the printer, so what you see on the screen may not be what your printer types out. When you type in the shifted 6 key, the Ctrl symbol (') on a screen, the signal your PC sends out is the equivalent of ASCII number 94 or 5E hexidecimal. The printer digests the PC's command, rotates the print wheel until it stops at the spoke (or finger or petal) assigned to ASCII characteristics.

ter 94, whacks a tiny hammer, and,

depending on the print wheel,

you may see the Ctrl symbol (*), an up arrow († 1), a copyright mark (®), a capital U with an umlaut (Ü), the umlaut alone (*), a fraction, or a right bracket (f). In the future, you may be able to tell your computer to change its display to emulate are. Disable Swedight Rec duive

m the future, you may be above to ten your computer to change its display to emulate, say, a Diablo Swedish Pica daisy wheel or a NEC Technical Math thimble. For now that would involve intkering with the PC's inner workings, intercepting keyboard commands, or developing a custom ROM chip. Leave it to the techies.

The Print Wheel of Fortune

Once you've decided to broaden your printer's horizons, your next step might be choosing a print wheel. While your choices are limited by the type of letterquality printer you own, there are still a number of possibilities.

Diablo, a subsidiary of Xerox, and Quune, a subsidiary of ITT, both used and and also wheels (they look like the petals and aids wheels (they look like the petals on a dishy that's been squashed flat) that fit each other's printers as well as a half-doen other makes. However, the characters are not always in the same sequence, so interchange with caution. The soci interchange with caution the series of the same sequence, so and the same sequence, so interchange with caution the same sequence, as a series of the same sequence, and the same sequence, and the same sequence of the same sequence.

5.46

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The Care and Feeding of Print Wheels

Mishandling your print elements or cleaning them with the wrong solution may be hazardous to their health and yours.

E veryone agrees that you should keep your print wheels clean. But how? There's considerable disagreement on what products work and how safe they are for print wheels-and people.

Computer supply firms charge about \$20 for cleaning kits that include a cleaning solution, cleaning pads, and a holder for the print wheel. Refills cost \$5 to \$10. The cleaning solution may be rubbing alcohol, possibly with a fluorocarbon additive that temporarily gives the wheel a shiny or wet look.

Qume recommends either soap and water or rubbing alcohol. Diablo says no soap, water, or rubbing alcohol; that company recommends its own cleaning kit that works on all daisy, thimble, and IBM Selectric wheels. Barring that, Diablo recommends either of two readily available chemicals, methyl-ethyl-keton (MEK) or acctone. Acctone is the main ingredient in nail polish remover.

Smith-Corona recommends rubbing alcohol dabbed on the spokes only, not as an immersing bath. NEC says that

soap and water, rubbing alcohol, or a household cleaner such as Fantastik are safe but marginally effective. Concentrated acetone will melt NEC thimbles, says company spokesman Joseph Tamker, while methyl-ethyl-ketone and Fedron (a platen cleaner) are safe for thimbles, but have ramifications for the user: They may cause cancer, NEC will be bringing out a thimble-cleaning kit later this year, Tamker says, that will get rid of the ink buildup without doing in the thimble or the user .- W.K.H.

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NEW FACE

fuller advantage of the PC's character set. Qume has a 130-character wheel for its Sprint 11/40-130 Plus printer.

The Selectric typewriter has been the standard by which letter-quality printer output is iudged.

With Diablo daisy wheel elements, you have a choice between high-strength plastic and metal-cowered plastic. Metal wheels theoretically have a life four to eight times that of plastic for three or four times the price, but they bend more easily

and are tougher on the printer because they weigh a bit more.

Other printers that can use either Disblo or Qurne wheels or their manticulartic or the printer of the printer of the printers of the transport of the printers and the printers also emulate Disblo or Quane printer color emulate Disblo or Quane printer color in case your software doesn't list their printer, and they may use doesn't list their printer, and they may use param doesn't list Zo. Ioh Fi Flo or the setup chart, you can tell the PC it's a Quane Sprint 5, feed it Disblo Hiype II ribbons, and use Disblo 96-character or Qume 96 WP wheels.

NEC printers use a "thimble" printer element. Compared to the flat daisy wheels, NEC's print wheel looks like a big sewing thimble or a miniature coffee cup with the handle removed. NEC thimbles

Proportional Magic

If you're bored with monospace but your word processing program doesn't support proportional spacing, try a bit of razzle-dazzle.

While you're waiting for the manufacturer of your favorite word processing program to upgrade it for proportional spacing, here's a trick to make your finished copy look better and read more easily.

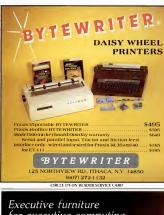
All you need is any word processing program and a printer that can space in increments of 120ths of an inch. I'll use WordStar as an example, but other programs can do this. too.

Turn on justification and microjustification. Then order the character spacing 1/20 of an inch narrower than normal. For 10-pitch faces that are ¹³/20 of an inch wide, use .CW 11 instead of .CW 12, or the equivalent command in another program. For 12-pitch faces that are ¹³/20 of an inch wide, use .CW 9 instead of .CW 10. That's all. The PC and printer do the rest.

If a line with a 65-space margin breaks after 61 characters, a typical occurrence, there are four extra spaces to be accounted for, or in the case of 10-pitch (12/120 inch) type, the equivalent of 48 microspaces. The microspaces are

distributed among the characters. Result: The ½1/20 of an inch specified plus the extra ½1/20 of an inch microspace restores all but a handful of the characters to their proper ½1/20 of an inch width. The few that remain ½20 of an inch don't look souashed toeether.

As a bonus, you can use wider margins without crowding the page. At 14/20 of an inch, a 71-space margin takes up the same width as a 65-space margin at 27/20 of an inch. 18' just the thing when you've got a lot to say and the boss says, "Bumstead, 5 pages maximum on that report!"—W.K.H.





NEW FACE

are arranged two characters per spoke and can hold 128 characters. Only NEC printers can use these thimbles, but since NEC is the world's number one producer of letter-quality printers, finding the thimbles is no problem.

Brother manufactures a daisy wheel encased in a plastic cassette that is used by Brother, Dynax (a similar printer), Comrex (Epson), Silver-Reed, and Daisywriier. The low-cost Smith-Croron TP-1 and TP-2 daisy wheel printers employ print wheels exclusive to Smith-Crorona, Juki uses Triumph/Adler 100-character typewriter wheels.

It's also possible to adapt an IBM Selectric with its interchangeable golf ball elements for use with a computer. But before you do that, ask some hard questions about the cost of conversion and the durability. Although the Selectric typewrite has been the standard by which letter-quality primer coupts is judged, a dediicated ketter-quality primer may be a better investment even if you already own a Selectric.

The Space Bar

Your next decision involves spacing and you may not have realized that you had a choice. For years there was only one type of spacing: monospace, in which every character is the same width. The space allocated for the letter i is just as wide as the space for the letter W. To make everything look right, narrow letters such as I and I are artificially widened and wide letters such as M and W are narrowed.

Monospace is still the most common type of spacing available on a print wheel, and monospace wheels are available in three widths or pitches:

• 10 characters per inch (cpi) or 10-pitch is often called pica type after the common Pica typeface. Most letter-quality printers can space in fractions of 1/120 of an inch. so a 10-pitch character is allocated 12/120 of an inch of space. In a word processing program such as WordStar, Mai's specified as, CW (character width) 12. On a standard sheet of 8½ × 11 twing pager

with 1-inch left and right margins, a 6½inch-wide typing area has 65 characters. The "pica" in pica-size print wheels shouldn't be confused with the pica mea-

With

microjustification, the PC directs the printer to insert slivers of space 1/120 of an inch wide randomly between characters

surement used by magazines and newspapers, which is % of an inch. Ten-pitch is the most common width, probably because it's the largest and therefore the easiest to read.

- 12 cpi or 12-pitch, generally called elite type, is slightly smaller than pica type. Each character is ¹⁹tzo of an inch wide. In WordSun, 12 cpi is specified as. CW 10. (More than a few WordSun users find it confusing to specify. CW 10 for 12-pitch type and. CW 12 for 10-pitch type.) A 6½-inch typed line has room for 78 elite characters.
- 15 characters per inch is useful when you really need to stuff a great deal of information into a limited amount of space. Each 15-pitch character is ½10 of an inch wide. A 6½-inch typed line can be set for 15-pitch type through software to 15-pitch type through software commands (CW 81 in WornSkaru) if their front-panel switches are limited to 10pitch and 12-pitch. These software comands are sometimes called printer setup commands.

With a letter-quality printer, character height is not generally considered. Most print wheels have characters 8 to 10 points high (a point is ½ of an inch), and each single-spaced line is 12 points or ½ of an inch, including the space between lines.



The Qume 130-character daisy wheel, evallable in a veriety of typefaces.

PS—Truer Spacing

ммммм

The alternative to monospacing is the proportional space (PS) wheel. The characters on proportional space wheels are truer to the way we handwrite or typeset, taking into account the widths of individ-

Crown
Caston
Times Roman
ABCDEPGHUKLMNOPQHSTUVWXYZ
abcdefghijklmnoppriturwxyz
NMMMM
mmmmmm
IIIII
BBCDEFGHIIKLMNOPQHSTUVWXYZ

IIIII iiii

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abodefghijklmnopqrstuvwxyz
MMMMM mmmmm
IIII

Figure 1: Proportional spacing is true to the way characters are handwritten or typeset. Wide letters naturally take up more space than narrow ones. ual characters. Figure 1 illustrates how proportionally spaced letters take up different amounts of room. A typeset capital W or M may be three or four times as wide as a lowercase. With PS print wheels the range is narrower, more like two to one. A line of proportionally spaced characters takes up about as much space as the same line in 12-oile types.

To use a PS print wheel properly, you need a printer that supports incremental spacing, invariably in 120ths of an inch, and that accepts PS wheels. You'll also meed a word processing program that supports proportional spacing. The current version of WardStar, for instance, won't space proportionally, but PeachText, The Final Ward. and MicroSoft Word will.

If the software doesn't support proportional spacing, the PS print where will still print, but it won't look quite right. The text will come out monospaced—every character will be either "9/x00 of 3/x00 fan inch apart depending on the pitch selected. At 10-pitch, spaces between lowercase letters will be noticeable, while at 12-pitch the capitals will be jammed together. (If you get appurently random characters, you forgot to fill per printer's selector switch from monospace to proportional space. PS wheels are arranged in a different order than monospace wheels.)

Don't confuse proportional spacing with microjustification or justification. To justify text, the PC inserts spaces between words until the right margin lines up. If a line of 62 characters must be fit into a 65space margin, the PC picks three words and inserts an extra space after each.

With microjustification, sometimes called microspacing, the PC directs the printer to insert slivers of space 1/20 of an inch wide randomly between characters. If justification and microjustification are used jointly, enough microspaces are added to align the right margin.

Both justification and microjustification have drawbacks. With justification, the gaps between words are evident and it's obvious from the result that a computer

did it, especially if you use narrow margins or automatic word wrap. With microjustification, the page looks good at a glance but the extra fractions of space between characters slow the reader down. The reader may not know what's wrong.

Courier typeface
ABCDFRGHIMKIMNOPQRSTUWWXYZ
abcdefghijklmnopqrstuwwxyZ
1234567890 tels%*°a*()_+
Pica typeface
ABCDFRGHIMKIMNOPQRSTUWWXYZ
abcdefghijklmnopqrstuwwxyZ
abcdefghijklmnopqrstuwwxyZ
abcdefghijklmnopqrstuwwxyZ

Figure 2: Examples of two of the most common print wheel typefoces, Pica and Courier. There ore many more styles to choose from. but will have trouble reading the copy quickly. Justified type is easier to read than microjustified type.

Proportional spacing takes advantage of the printer's microspacing capabilities but uses them purposetully, not randomly as a monospace wheel does. The software has a built-in lookup table that allocates those 120ths of an inch according to how wide each character needs to be. Proportionally spaced material can be either justified (even right margins) or ragged (uneven right margins).

Type Style

Now you get to make your most creative decision—the typeface itself. See Figure 2 for examples of some of the most popular faces, Courier and Pica. To many people, Courier type is reminiscent of an IBM Selectric, while Pica type may seem

BY THE TIME
Y U DISCOV R
A WORN OUT
DISK, IT'S PROBA LY
TOO I OT

more like an old Underwood or Remington manual typewriter. Note especially the differences in the lowercase g and v. The two faces are similar in that they are both serif type styles in 10-pitch. It's easier to get a feeling for a print wheel by looking at a text example than by examining a chart of characters, and you'll probably want to see a wide range of typefaces before you

make a choice. What else should you look for? On some print wheels, the zero may be slashed. The apostrophe or single close quote may be at a 45-degree angle to distinguish it from the single open quote mark. The crossbar of the e may be tipped at an odd angle; the s may be an avant garde squiggle. On some print wheels, the lowercase letters may actually be small capitals.

the alphabet and numbers, there may be completely different punctuation and special characters on a print wheel. Look for differences in the shifted top row, which on a PC monitor is:

! (a # 5 % * & * () - + In addition, substitutions are often made for the braces or brackets (1 1), curly brackets ({ }), single open quote (*), tilde (*), backslash (\), vertical bar (|), and left

and right arrows (< >), since these characters don't get much of a workout in word processing applications. For instance, some legal fonts assign the fractions 1/2 and 1/4 to the left and right arrows.

Check with ASCII

For a better idea of the character set. take a look at ASCII listings for these In addition to style differences among characters to compare what the PC outputs to the screen to what a particular print wheel produces on paper. Diablo and Oume have excellent typeface listings that include ASCII charts arranged from low to high along with text examples. NEC has concentrated until recently on building ultra-reliable printers and rudimentary typecharts, but the company promises to produce better thimble comparison charts (still no ASCII charts).

Finally, look for a print wheel that goes beyond the standard 94 characters (the PC has 47 alphabet, number, and punctuation keys and 47 more shifted characters). You can access the additional characters through the Alt key or with a special software command ordering the printer to "shift out" to the extended characters. The extra characters generally will include a set of capital letters in a contrasting typeface; fractions, half-size superscript num-

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NEW FACE

bers, and miscellaneous business symbols; or special graphics characters.

An extended character set gives a printer real flexibility, but the number of keystrokes you need to access them can be annoying. If you work with many special characters, a keyboard enhancer such as RoseSoft's ProKey is a godsend. For instance the WardStar command to access the fraction 1/8 on a NEC printer with a Super Courier thimble is Ctrl-P. Ctrl-Q J, Ctrl-P, Ctrl-W. Those nine keystrokes could be shortened to two, possibly Alt-J, with a keyboard enhancer that memorizes the special key sequence and assigns it to one key.

Even if your print wheel has more than 94 characters, you may not always be able to access them. For instance, NEC's tonof-the-line 7710, which uses a serial interface, can readily produce only 94 of the 128 thimble characters when hooked to a PC. If you're still shopping, you'll find that some manufacturers offer three variations on the same printer: serial interface, parallel interface, and PC-specific parallel interface. The PC parallel interface may cost \$200-\$400 more (as in the case of NEC's Spinwriters), but the difference pays for special ROM chips that, when they work correctly, make the NEC think it's really a letter-quality version of IBM's dot matrix printer. Qume deserves special mention for its sensible and sensibly priced solution: a single printer with \$95 plug-in interface boards for specific com-

puters or interfaces, including the PC. Once you decide on a printer and a group of print wheels, take good care of the print elements. Print wheels respond well to being started, spun, stopped, and hit with a hammer 10 to 55 times per second, yet they're susceptible to heat, dust, bending, and being dropped on the floor. Daisy wheel or thimble wallets that hold four to eight print wheels are your first line of defense. They cost \$5 to \$10 each. Because disasters are still possible, keep backups on hand at least for your main. workhorse print wheel. Try to use the print wheels for printing only, not as coasters

for coffee and tea cups.

Fabric or Film

It's best to keep separate sets of print wheels for fabric ribbons and for film ribbons. Fabric ribbons leave ink residues that fill in and blur the enclosed characters, and some of the sharpness of a film ribbon is lost when the ribbon is used with a wheel full of fabric ribbon crud. Regular cleaning helps restore sharpness, although the makers can't agree on what chemicals

After each character strike on a multistrike ribbon the film advances a fraction of the character width.

clean and what don't (see sidebar).

Ribbons come in three types: fabric, multistrike film, and single-strike carbon. Fabric, the familiar typewriter ribbon, comes in black, red and black, or shades of brown or blue. Fabric lacks the clear detail of a film ribbon but is cheaper and doesn't run out abruptly the way a film ribbon does. Fabric ribbons have definite shelf lives; after a year on the shelf they may lose some of their boldness. Try to buy them from a dealer who has rapid turnover. Store an opened ribbon in a sealed plastic bag if you won't be using it for a week or so. If the ribbon develops a dry spot, spray the spot with just a trace of WD-40, the spray lubricant. It works like a charm. Don't overspray-one squirt is

After each character strike on a multistrike ribbon, the film advances a fraction of the character width. Because of the film's spongelike ability to absorb material from adjacent unstruck areas, you get several characters out of each character width of film. Multistrike ribbons are not profoundly affected by sitting on the shelf

good, but two are not better.

NEW FACE

before use. They are available in colors, usually brown or blue, that work well with lightly tinted stationery.

If you want the highest quality, price no object, buy a single-strike curbon ribbon that advances one character width for each character struck. The impression is slight y darker and sharper than the multi-strike ribbon. It's a good choice for documents that will be photocopied or printed. Not every manufacturer offers single-strike ribbons.

A fabric ribbon is good for 700,000 to 2½ million impressions, say the manufacturers. A multistrike ribbon lasts 180,000 to 400,000 characters, depending on the brand and amount of film. A single-strike ribbon may only last 35,000 characters. As a rule of thumb, figure 60 to 65 doublespaced pages per 100,000 characters.

To save a few dollars, it's possible to buy off-brand ribbons. Quality can vary considerably, be sure that when you order a brand-name ribbon you don't get sold off-brand merchandise. Third parties also make "compatible" print wheels that may or may not equal the quality of the factory original.

Re-inkers for fabric ribbons are available for \$30 to \$60. They work, but you have to factor in the initial purchase price and the time spent using the re-inker.

A Working Library

Here are some good choices to begin your library of typefaces. Courie and Pica, both 10-pitch; one of the Elite faces, L2-pitch, a proportional space when the as Bold PS, a 15-pitch when to tame with spreadsheers; a big 10-pitch face for spreadsheers; a big 10-pitch face for spreadsheers; a big 10-pitch face, possibly matched to one of the other faces; a Prestige Elite for bolder at Prestige Pica or Prestige Elite for bolder print, and a sun serif (no curficues) face:

Add one or two print wheels that appeal to you, some lightly tinted stationery, and brown or blue ribbons in addition to basic black, and let your letter-quality printer show off its versatility.





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Automated Letters: Fill-in-the-Blanks

A new species of word processing programs promises to take the drudgery out of writing business letters. Be careful, though. There's no telling where this sort of thing may lead.

es, I know that being a writer may not appear to be the toughest of jobs. It's inside work, there's no heavy lifting involved, and you get paid for sticking your nose into other peoples' business.

business. But really, folks, it's a difficult way to cam a living. Toting those verbs and shiring flooregoing personance and get to be pretty wearing. You've got to be creative the begiest problem is that once you've finally come up with a really nice piece of writing, you can't just keep on using it again and again, like a microprocessor chip assembly like once the design is done. No, you've got to file those perfection, and those highly polithed modification verbs, and those highly polithed modification between the control of the property of the prop

So, it was with a mixture of angerbermsement, evy, and fear that I element on a new species of "automatic letter-writing" word reprocessors that have began to still einto the PC market. These packages present a "filli-nthe-blanks" approach to letter writing, guaranteed to make you, CHOOSE ONE: (a) more literate; (b) more threatening; (c) more romantic; or (d) more threatening; (e) more of market you,

Do you need a scathing letter to your landlord threatening to haul him into court

if he doesn't pump the 6 inches of raw sewage out of your bathtub immediately, or at least within 6 months if he's not to busy? No problem!

Have you been searching high and low



Corey Sa

for 50 ways to leave your lover, in print? How about an instant form letter to your long-lost relative in Chillicothe, Ohio, who's somehow traced his way through six changes of address to find you, and who now wants to borrow \$75 for a new snowmobile helmet. Just use Letter 65/7!

Well, I suppose there really may be a market for some of these products, although I can imagine all kinds of disasters emanating from the PC of a less-thanaware letter writer. Picture the conse-

quences if the love letter were sent to the landlord and the dunning note to the letter writer's boss!

These products also bring to mind the word game that was very much in vogue in the late fifties and early skites. (It was commercialized into a series of Mad Libs books for those who needed a creative books.) The scheme worked this way? You started with a nearly complete short story. Cauthout all with a nearly complete short story. (almost any would do) and removed about 20 nouns, verbs., and other parts of speech. Them the conductor of the session speech. Them the conductor of the session would be a supply the conductor of the session with the participant of the production of the session with the production of the session with the story.

The results, depending upon the situation and the sobriety of the players, would range from the unusual to the bizarre to the scandalous.

Here, let me give you an example. I've chosen a press release at madom from the pile siting on the floor of my office. Write down on a piece of paper the following: a place, a date, a brand name, four different pieces of computer hardware, three adjectives, a gerund, two popular buzzwords, a famous name, and a pair of exciting verbs.

Now, plug your words into this press release:

(PLACE) (DATE) The

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day, incorporates state-of-the-art features in a (ADJECTIVE), (ADJEC-TIVE) unit, and at a much lower price than that offered by any competing product.

The new product offers a greatly expanded range of capabilities, including a feature that enables a (COMPUT-ER HARDWARE NOUN) to emulate a (COMPUTER HARDWARE NOUN), with full (BUZZWORD) and expandability through the use of plugin (COMPUTER HARDWARE) in (COMPUTER HARDWARE).

NOUN), to be available later.

(FAMOUS NAME), president of the company, said, "The addition of (BUZZWORD) to our product means that for the first time users will be able to (VERB) charts, or (VERB) numbers, without giving up (GERUND) the bottom line. We think that is truly (ADJECTIVE)."

Look out, public relations consultants. Your days are numbered.

Personal Use

As for my personal needs, though, I'm harder to please. I individually craft all of my letters, and they are satiable for framing by the recipient. (Well, yes, it is true that I once prepared a "search and replace" Christmas letter for my far-flung friends. But they all understood—I'm a busy man, you see.)

I do, however, have need for one letter that I find I must send once a week these days. Of late, my job has taken me pretty far afield from the comfortable environs of One Park Avenue. I've been forced to spend a lot of time in the provincial outbacks of America, in places like Boston and San Francisco and Las Vegas, My wife claims that she still recognizes me as I stand in the doorway each Friday night, but there's a certain tremulousness in her voice when she asks, "Corey?" And last Sunday, as I packed my bag for yet another trip, my baby son crawled over and deposited his pacifier in the suitcase. So I'm working on a way to maintain

regular and speedy communication with zine.

Janice and Willie. Here's the first draft of the letter my computer and I will electronic mail their way:

Dear (NAME OF WIFE):

I'm so sorry you (WERE ASLEEP, IN THE SHOWER, MISSING) this moming as I left for the (AIRPORT, TRAIN STATION, SUBMARINE BASE).

This time I'm off to (CITT) where I hope to (INTEXVEW, BE ABUSED BY, SWAP RUMORS WITH) the bead of that new computer If mu with the (HOT NEW, OLD STANDARD, OVER-HYPED UNDERCAPABLE) product I told you about a couple of weeks ago. Oh, by the way, plossed don't forget to call our broker and (BIV ALL THE IBM STOCK WE CAN AFFORD, SELL ALL THE IBM STARE WE HAVE MORT-GAGE THE HOUSE AGAIN AND INVEST IN HOO BELLIES).

I hope you've fegiven ne for that itile contretening at the neighborhood barbcuc last week when I got home after dark. It mily was an acciditer-1 didn't realize the woman I started dragging off into the baskes was (YOUR FRIEND NANCY, THE GOULDS' ALI PARE GRILE, THE SCHOOL PRINCIPAL). You have to understand, (NAME OF WIFE), how was I to know that since we've last seen each other you have (DVEP YOUR HAME).

PURPIE, BOUGHT A NEW DRESS, GROWN AN INCIPATION.

Anyhow, I'll be sure to be more careful on Friday night when I get back home. And, since you asked, I will be wearing a brown tweed sport coat and carrying a beige portable computer under my right arm.

> Sincerely yours, Corey (your husband)

This letter is available for licensing for other users with similar needs.

Corey Sandler is editor of PCjr. Magazine.

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Words to the Wise

Two new word games for the PC, Tic Tac Show and Spellakazam, are good educational tools, fun to play, and they are not necessarily just kids' stuff.

Pecopic have always been fascinated by good word games, in part because the skills required to play them are perceived as valuable. We use words constantly, and anything that helps with a more of them, is not a trivial pursuit. Word games mentally stimulating, and, like the two reviewed here, Te Tac Show and Spellazam, many are both educational and fun to play. These games were designed for children, but they are not just kinds 'staff.

Tie Tac Show's format is a cross between traditional fic-acto- end and artivia quiz. To win, you must claim three squares in a row by correctly answering the questions. "behind" those squares. A correct answer gains one point and places your symbol (X or O) in the square. An incorrect answer gives the square to your symbol (X or O) in the square to you reported, but no point is a warded. Thus, you must choose squares that will help if you answer correctly, but will not help you answer correctly, but will not help you answer correctly, but will not help

Tic Tac Show

Computer Advanced Ideas, Inc. 2550 Ninth St., #104 Berkeley, CA 94710 (415) 526-9100

List Price: \$39.95 Requires: 64K RAM (DOS 1.1) or

128K RAM (DOS 2.x), one disk drive, color/graphics adapter. CIRCLE 789 ON READER SERVICE CARD your opponent if you answer incorrectly. The main men presents you with three choices: play the game, build or change your own game, or quit. The disk also includes a demonstration that will begin in 30 seconds if no keys are pressed. Once you elect to play a game, you are prompted to answer a number of questions: "Do you want sound effects? What is your name? Will someone else play also? What is his or her name? Would you

like instructions?" It would be difficult for even a child to get lost in this game.

The computer then builds a game around any of 22 subject areas on the game disk, or you can create your own disk that covers a subject of your choice. The preprogrammed subject files cover such topics as United States presidents, unusery thymes, the human body, mythol-yogy, sports, and academic subjects like math, French, and elementary science.



In this screen from Tic Tac Show, the game's "hostess," Carol, corrects an enswer to a sports question. As in a television show, names and scores appear on her "dask."

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The play of the game alternates turns between you and your human opponent or between you and the computer. A cute graphic of the show's hostess, who is named Carol, keeps the game moving; prompts appear above her head in cartoontype bubbles. She might say, for example, "Phil, it's your turn to pick a box." I would then look at the nine squares forming the tac-tac-toe board and make my selection. A question would appear in one of four formats: multiple-choice, fill-inthe-blank, true-or-false, or question-andanswer. Although you never know which question is going to pop up behind a particular square, the question behind the central, most strategic one is always a doozie. A round ends when you or your opponent gets three squares in a row or when a tie occurs. In this case, the round is awarded to the player with the most points. At the end of any round, you can stay with the

exit the program. You may be wondering what happens when you know the answer to most of the questions in the 22 subject areas. You use Tic Tac Show's mini-authoring system to create your own subject. This feature allows you to determine the level of difficulty too, so for many players, the authoring system may be the most appealing

same subject, exchange it for another, or

Tic Tac Show's format is a cross between traditional tic-tac-toe and a trivia quiz.

aspect of the game. Say, for example, your child is having trouble with trigonometry, you can create games on that subject, tailored to his exact needs. And you can update the material at any time. An even better way to teach a child about trigonometry might be to have your child create a game on that subject for you to

play. Give the child some reference books, let him search for the answers and the questions, and then create a game to check the work.

Tic Tac Show is an excellent family game, and using it to create your own games makes it an introducton to computers, too. It uses sound effects and animated color graphics, although neither of these features are particularly strong.

On PC's scale of one to six,	Tic Tac
Show rates:	
FUN:	4.5
CHALLENGE:	4.0
GRAPHICS/SOUND:	3.5
TOTAL SCORE:	12.0

Spellakazam

DesignWare, Inc. 185 Berry St., Building 3, #158 San Francisco, CA 94107

(415) 546-1866 List Price: \$39.95

Requires: 64K RAM, one disk drive. color/graphics adapter CIRCLE 800 ON READER SERVICE CARD

DesignWare developed Spellakazam in conjunction with Silver Burdett, a wellknown publisher of educational materials. It is designed to teach kids in grades 2 through 8 how to spell. In fact, the 400 words on the game's 20 spelling lists were culled from a successful textbook series titled Silver Burdett Spelling. So why not just give your child the books, which are more comprehensive? Why should children learn to spell from a computer?

The answer to the first question is easy once you've seen the game: Spellakazam not only teaches spelling, it is an entertaining maze/race game that children are likely to stay with long past the day they can spell the word acquaintance. The answer to the second question is not so obvious: You can use this software to create your own games, fine-tuned and updated to suit the changing needs of your children.

There are two games in Spellakazam. Both are for either one or two players but only one game is in effect at any time. In

ARCADE

Game 1, the player's character appears next to a computer-controlled magician in the upper left corner of the maze, which also contains the letters of the alphate also make the maze constraints was kept simple to appeal to 70 to 14. year-olds. At the bottom of the screen is a sentence with a word missing, represent sentence with a wood missing, represent objects to so pell the missing word by objects is to spell the missing word by moving a character through the maze to pick up the letters in order, and then pick up the magician's hat in the lower right corner to end the round.

Fortunately, a round will not begin until you move your character, which gives you all the time you need both to figure out the word that fits the sentence and to plan a strategic route for picking up its letters. Once you start your character position the modeling hearter to reachly



moving, the magician begins to steadily

To finish the word release "Phil" must thread through the maze to pick up the final e.

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ARCADE

make his way through the maze towards his magic hat. You pick up a letter by moving your character next to it and pressing the joystick button or spacebar. The letter immediately appears next to your name. You can drop a wrong letter by pressing the second joystick button or the Return key, One warning: Spellakazam is really designed for joystick play, so using the keyboard is difficult.

If you can pick up the letters to spell the word that belongs in the sentence and get to the magician's hat before he does, you will earn bonus points. Since the magician moves quickly and without mistakes, the game allows players to send the magician back to the maze's starting point by picking up one of the bird symbols. This move doesn't interfere with spelling the word, but each bird you use costs you two points.

In the more challenging Spellakazam Game 2, the magician no longer just heads for his hat-he tries to spell the same word you're trying to spell. Otherwise, everything works the same as in Game 1. In both games, whether or not you beat the magician, you get a visual surprise as well as points each time a word is spelled correctly-a little creature jumps out of the hat and places the word in the sentence. If the word is spelled incorrectly, a line is drawn through it, the correct spelling is shown, and you are allowed another chance to spell it correctly by moving through the maze a second time. The computer will use that word again later.

Each round is played using one list of 10 to 30 words. The 20-word lists that come programmed on the disk are labeled for grades 2 through 8; there are also three speed settings that create 21 different skill levels. Each word list is built around a specific spelling rule, such as "short vowels" for a second-grade list. Before setting up the game, the computer displays the spelling rule followed by the word list. Then it asks if you want to use that word list and whether you want to play with core words only (10 words), core and basic words (20), or core, basic, and bonus words (30). The player decides whether to preview the word list.

The 400 words on the spelling lists represent common spelling rules as well as commonly misspelled words and are the result of years of language research by the Silver Burdett Company.

A round does not end until all players have spelled all words on the list correctly. at which point the computer displays a progress report for each player that might

Spellakazam is really designed for joystick play, so using the kevboard is difficult.

say: "Phil, you spelled the words correctly on the first try seven out of ten times. Words you need to practice are . . . "

You can create your own games of Spellakazam by assembling word lists, spelling rules, and context sentences and storing them on a blank disk. To show my adult friends how challenging this "kids" stuff" can be, I've created games using very difficult words and obscure context sentences. You can also set up other kinds of games, like quizzes on United States presidents in which the child not only has to spell the names but must guess them in the first place. For example: "President ----- had the most children of any president (ten), and died in office."

Spellakazam will appeal to a younger and smaller age range than Tic Tac Show, but only because it was designed around a much more specific skill. As a supplement to, not a replacement for, classroom learning, the program is very good, particularly if you create games from your children's weekly school spelling lists.

On PC's scale of one to six, Spellaka-

zom rates:

FUN:	4.5
CHALLENGE;	4.5
GRAPHICS/SOUND:	3.5
TOTAL SCORE:	12.5

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Introducing The PC Family

The background, technical, and programming material in this quartet of new introductory books on the PC, XT, and PCjr can be a great help to new owners as well as to prospective buyers.

If you are the owner of a new IBM PC or PC/F, hope to own one soon, or are just interested in IBM personal computers, you might find one of the many available introductory books on these machines helpful. The four reviewed here give background information on computers, describe their particular machines exhaustively, and discuss the software available for them.

Que Corporation has just published an updated edition of its popular IBM's Personal Computer, a comprehensive primer for the PC that was one of the first such books when it was published in February 1982. The first edition covered the original IBM PC-IDOS 2.0. The two editions are quite similar.

The book first discusses the PC's place in today's world, briefly describing some of IBM's small business computers and comparing the PC with other microcom-

IBM's Personal Computer (Que Corporation, 7999 Knue Rd., Indianapolis, IN 46250 [317] 842-7162, 1983)

300 pages; softcover; \$14.95 (Ist edition) 336 pages; softcover; \$15.95 (2nd

edition)

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puters on the market. It next covers the system unit and peripheral hardware in great detail. You will probably learn more about the 6845 CRT controller chip and



the PC's other hardware from this book than you cared to know. Chapter 4 looks at the operating systems that the PC uses and compares PC-DOS with CP/M-86.

One lengthy section examines a few of the hundreds of programs that now run on the PC, and another gives a good introduction to personal computer communications. The final chapter discusses purchasing a PC, installation, warranties, and service. IBM's Personal Computer includes an excellent glossary and several useful appendices that list all IBM BASIC commands and statements.

IBM's Personal Computer assembles and presents basic information in a way that technically unsophisticated readers will understand. With this book, potential PC buyers can learn more about the system in a couple of evenings at home than they could glean from many hours of discussion with most computer salespeople.

Que Corporation's Introducing IBM PCJr is one of the first books out on IBM's latest entry in the microcomputer market. It follows much the same format as IBM's Personal Computer.

Since PCjr was designed for the first-time computer user, this book was written with novices in mind. It answers such questions as "Can I berak the computer?", "Can I break the computer?", "Can I break the computer?", and "How can I get my computer fixed?" Douglas Ford Cobb and Chris DeVoney describe how microcomputers work by using analogies that make the subject understandable to the uninitiated.

The book briefly describes IBM itself and the events that led up to the PCjr's announcement, including the rumors that circulated during the summer of 1983.

Cobb and DeVoney cover the PCjr's hardware in detail in Chapter 3. They compare the 8088 microprocessor with the PC's 8086 and with other 16-bit processors. They describe each peripheral and discuss its design, including the new infrared-link keyboard. The authors devote an

entire chapter to DOS 2.1, in which they briefly describe each command and fea-

In Chapter 5, the authors explain the

differences among the various versions of BASIC for the PCir-Cassette BASIC. Cartridge BASIC, and Compiled BA-SIC-and compare them to the PC's Disk BASIC and BASICA. Cartridge BASIC. the newest version, is particularly carefully dissected. The authors also describe IBM's Logo and the Macro Assembler in nontechnical terms

Like the PC book. Introducing IBM PCjr reviews software currently available for the machine, devoting a chapter each to personal management, educational, and entertainment software. Each program review lists the system requirements and



the price. The reviews are good and will help you make an educated selection. The book's most useful chanter. "Putting It All Together," catalogues and prices all the hardware and software you would need for a complete PCir system. Such a system turns out to be a lot more

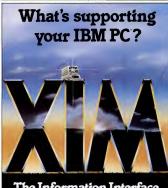
expensive than most people might think. Introducing IBM PCjr's last two chapters examine the machine's competition (such as the Apple IIe and the Atari game computers) and speculate on possible future expansion of the PCir. The chapter on expansion, which makes particularly interesting reading, describes the areas in which competitors are likely to market

Introducing IBM PCir

Douglas Ford Cobb and Chris DeVoney (Que Corporation, 7999 Knue Rd.,

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BOOK REVIEW

add-on products for the PCjr.

Introducing IBM PCjr is a comprehensive primer that should be required reading for anyone contemplating a PCjr purchase.

I BM PC—An Introduction to the Operating System. BASIC Programming and Application is actually the second edition of a previous book by Goldstein and Goldstein titled IBM Personal Computer—An Introduction to Programming and Applications. Despite the similarity in the titles, the two books are very different; the authors have done a very thorough revision.

Intended to teach the computer novice IBM PC fundamentals, the contents of the book range from a general primer on computers to a brief description of assembly language. Many of the chapters include practice exercises and "test your understanding" questions. Technical descriptions and details are kept to a minimum.

The first 60 pages contain basic instructions on using your PC, beginning with how to turn it on and moving on to the keyboard and DOS.

The rest of the book is primarily devoted to a clear and concise introduction to PC BASIC. It provides a solid grounding

IBM PC—An Introduction to the Operating System, BASIC Programming, and Applications Larry Joel Goldstein and Martin

Goldstein (Robert J. Brady Company, Bowie, MD 20715 [301] 262-6300, 1983) 392 pages; softcover; \$14.95

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IBM PCjr Favorite Programs

Explained

Donald C. Kreutner

(Que Corporation, 7999 Knue Rd. Indianapolis, IN 46250 [317] 842-7162, 1984)

189 pages; softcover; \$12.95 CIRCLE 707 ON READER SERVICE CARD without getting bogged down in the details that might cause a novice to give up. Examples and exercises reinforce the Examples and exercises reinforce the BASIC section cover getting started, working with data, files, graphes, surdines, and types of numbers. The sequence in which these topics are covered differs from the norm in books of this type, but in works well with the approach the authors have selected. The chapters on BASIC will tack by our cough for most home pro-

gramming purposes.

A section at the back of the book called "Assumers to Selected Exercises" contains program listings, flowcharts, and other answers that are not in the text. Also at the end of the book are three tear-out cards. The first lists all the DOS 2 commands, briefly explains each, and describes their formers. The second is excribes their formers. The second is excribed their formers. The second is excribed that the second is the second to the second their dists. BASIC 2.0 error message. These reference cards are real timeswers when you just want to look up the format of a command or find out what an error number means.

Goldstein and Goldstein have written a winner. If you are the owner of a new IBM PC and don't yet feel comfortable with it, this book will go a long way toward making you feel like an experienced computer user.

In IBM PCy. Favorite Programs Explained, author Donald C. Krottner gives 40 BASIC program listings, each with informative text explaining some of the program's listensal workings so you can follow its flow. This format is identified to the program's listensal workings so you can follow its flow. This format is identified to the programs for the T1991/4 and Commodered for comparisons book explaining programs for the T1991/4 and Commodered for comparisons. The PCy book was written for the novice BASIC programmer and includes 53 pages of PCy Bayes Commands, statements, and functions with examples.

One problem with this book is that some of its programs don't operate the way the text and the illustrations indicate they will. The problems are small, such as a title that prints at the bottom of the screen instead of at the top as the illustration shows, but novice programmers need

IBM PCjr Favorite Programs Explained gives 40 BASIC program listings with text explaining the program's inner

workings.

exact results. Experienced programmers can examine the program and realize that the title is supposed to print at the bottom, but novices immediately look for what they did wrong. The other problem is really just an irritant. Kreutner has committed an unpardonable sin common to many people who write books of program listings-his line numbers are not consecutive increments of 10! Even if his programs required some debugging before publication, the PC's (and PCjr's) RE-NUM command could easily have fixed the line numbers. It is bad enough to have to enter a program by hand-this problem prevents you from even using the AUTO line numbering function

Books written for beginners should meet a higher standard than those for more experienced programmers; this one doesn't quite measure up. Using useful BASIC programs as teaching tools is a good approach and deserves more careful attention to detail than the author has given here.

The number of computer books on bookstore shelves is increasing daily. These books can save you time, money, and frustration by giving you a solid base of information before you leave the house to do your computer shopping.

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Creating Order From Chaos

Whether you begin the writing process by making a rigid outline or by brainstorming randomly, there's a program that can help you organize your thoughts on the screen instead of on paper.

ew people attack writing projects head on. For most, there's a crucial period of trial runs, paper shuffling, desk cleaning, and looking through notes and references. You don't have to give up this approach entirely when you begin writing on a PC. A growing number of programs are designed to help you get organized on the screen instead of on

Arranging thoughts on paper and fleshing them out with the facts are the foundations of most good writing. Database managers and card file programs are useful tools for organizing facts (see "Getting Organized on Your PC," PC, Volume 3 Number 5, and "PC Filing: It's in the Cards," PC, Volume 3 Number 7). Here's another group of programs to help you move smoothly from data to prose.

The method that will work best for you depends on your personal working style. You may be attracted to a clearly structured approach that works like a blueprint to give your project a definite shape. Or you might prefer a more free-form approach in which your work coalesces into form out of apparent chaos. Some people stick with the same technique all the time; others vary depending on mood and project.

If you start your writing projects with a

strong outline written on a yellow pad, the

best program for you may be ThinkTank



fomia. This program combines a normal text editor with an editor/formatter designed specifically for outlines. With ThinkTank, you create your out-

line as a series of headings, each indented to show its relation to others. ThinkTank can show you an overall display of major headings or you can zoom in for a closer look at particular sections. Along with each heading you can enter

a "paragraph" of text-actually up to 20,000 characters with breaks and indents. When you print out your file you can print the headings, the text, or both. This means that once you have finished your outline and filled in your text beneath the proper headings, you can print out a final document without reformatting your file or editing out the headings.

If outlines cramp your style, and you prefer to make notes in your margins and draw arrows back and forth between paragraphs, you might be happier with The Idea Processor from IdeaWare in New York City. It's an integrated word processor and card file that meshes the two functions quite smoothly. Like 1-2-3, The Idea Processor not only performs its individual functions well but makes them all the more useful by providing easy routes from one mode to another.

As a card file, The Idea Processor is comparable with other standard filing programs. You enter data on individual "cards," which in turn are grouped in "drawers" and "cabinets." The data are indexed by keyword, and you can call up cards using a selection of keywords or keyword combinations.

Card Shark

Each entry can be up to 8,000 characters long, and you can use a full set of word processing commands to edit each card. You can "import" files onto cards (providing they're within the size limit) and write cards out to PC-DOS files. Unfortunately there is no automatic keyword generation, so you have to declare the keywords yourself, and you're limited

WRITING

to declaring a mere ten per card. When you're working with the editor you can switch directly into the card file at any time. You can mark sections of text in

your main document and copy them to a card or bring the contents of a card back into the text. You can even include special commands on your cards to reference chrome monitor.

graphic displays. Then, if you have a color monitor, the appropriate image will appear on the color display while you edit the accompanying text on the mono-

Like most people who deal in information, 1 keep scores of three-ring notebooks, but I don't always make good use of them because it gets harder and harder to remember what information is written where

Notebook, distributed by Digital Marketing in Walnut Creek, California, is essentially a three-way cross between a database, a card file system, and a text editor. As in a database, you define a record format to store your information. As in a card file, you can type text in free

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format within each field. And as in a text editor, you can add, delete, search, replace, and format the text.

This combination works well for structured records. The examples in Notebook's tutorials include phonograph record collections, address lists, bibliographies, and recipes. The file searching and reporting functions are good, and the editor is adequate.

I had hoped for a smoother interface back and forth from long text documents. However, the manufacturer seems to have a regular revision cycle so 1 may get my wish in the next version of Notebook. Meanwhile, even the older versions may fit the bill for your needs. (For more on Notebook and other programs by Digital Marketing Corp., see "The Researcher's Assistant," PC, Volume 3 Number 1.)

Needles in Haystacks

FYI 3000

FVI Inc

Notebook, The Idea Processor, and ThinkTank are all practical for smaller files of data, but they're not really well suited for files that run into megabytes. If your writing project depends on finding data that you know is filed somewhere in your enormous system, you may need a text search program. FYI 3000 from FYI. Inc., in Austin, Texas, or ZvINDEX from

P.O. Box 26481 Austin, TX 78755 (512) 346-0133 List Price: \$395 Requires: 128K RAM, two disk drives. CIRCLE 732 ON READER SERVICE CARD

ZvINDEX ZvLAB Corp. 233 E. Erie Chicago, IL 60611 (312) 642-2201 List Price: \$295 (demo package, \$50)

Requires: 192K RAM, two disk drives, DOS 2.0 or higher, ASCII files.

CIRCLE 733 ON READER SERVICE CARD

ZyLAB Corporation in Chicago, can | systems, but for smaller projects you can index hundreds of files either by a selected get along with floppies. word list or by every significant word in

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To use either program, you take all the files. They're best suited for hard disk vour files concerning a particular topic and



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WRITING

run them through the indexing function. Although the indexing can take a few minutes per file, the process is fairly automatic, and you don't have to pay attention to the screen. Once the files are indexed, you can ask the program where any word or combination of words is located.

Using these programs is similar to using a commercial databath. You formulate an initial search and then narrow or widen it until you have a reasonable number of "hist" is look at. You can view the matching sections, print out the files containing them, or copy selected sections of text to a new file. If you anticipate repeating a search or performing a related one, you can store your search criteria for later reuse.

A feature of ZvINDEX that I particularly like is a "distance" criterion: You can specify that a matching file must contain two selected words with no more than a specified number of words between them. The manual shows how useful this would be for searching letters pertaining to a scientific research project, but I've also found it useful in editing my novel. Because I've started and stopped several times. I don't always remember all the details of each character's life: with ZvIN-DEX I can search for a character's name by typing in the word name/the word "vears" to find his age, or name and "hair or locks or mane" to find hair color.

The Best Is Yet to Come

None of the programs mentioned here can even approximate the efforts of a trained researcher working with even a simple line editor. Because all the programs deal with words strictly as character strings and without any consideration of meaning, what would be obvious to a person is bilithely ignored by a computer. Eventually artificial-innelligence techniques will appear in these type of pronogues will appear in these type of proposes of the programs of the programs of the programs of the programs can only help supply order and arrangement. Judgment, craft, and beauty are still up to your still up to your set and up to the programs can only the pump of the programs can only the pump of the programs of the prog

Legal Persuasion

Lawyers are increasingly using graphics and spreadsheet software to support their arguments and clarify their opinions. Multiplan and 1-2-3 are two favored packages.

ed, green, and turquoise bars, blue and orange curves, jagged purple and brown peaks marching through black grid lines. Would you have taken this graph for a legal opinion?

Well, it may not look like one, but that's the form in which opinions are emerging from more and more law offices—as art-department-style graphics created at the flick of a computer key.

In the midtown-Manhattan office of Windles, Mars, Davies & Ives, pranlegal Chuck Silva keys into his IBM PC the weekly and monthly Department of Commerce figures on steel import quantities of domestic production, and percentagion, assistant to Perre de Ravel d'Esclapon, who represents foreign steel products assistant to Perre de Ravel d'Esclapon, who represents foreign steel producers, im pages of single-spaced typed statistics, the kind that induce an instant case of MEGO ("my exp glaze Over").

But wait! With a few more keystrokes, Silva converts these indigestible numbers to glorious graphs using Lous. 1-2-3. Suddenly, relationships one could perceive only after hours of tedious study become readily apparent as the brightly colored shapes emerge from the Hewlett-Packard HP 2470A olotter.

Do you want to know what percentage of steel consumed in the United States is imported from Europe? Whether imports



are unpacing connects production? Of it the quotes are too high? See the chart in Figure 1. Pierre de Ravel d'Esclapote with seasonal variations, for his forecasts, which he inserts into briefs on international trade controversies submitted to foreign and domestic government agencies.

Fascination

"I'm fascinated by technology," says de Ravel d'Esclapon. "The 1-2-3 graphics permit me to make a more persuasive case than I can with pages of pure numbers. It saves analysis time, too. The human mind grasps an analog presentation faster and better than a digital one."

2-3 wish list? "I wish 1-2-3 had telecommunications capabilities so we could access government databases directly. Now, we have to rekey everything we get from them because 1-2-3 is incompatible. I look forward to evaluating Lotus' Symphony program as soon as it's available."

Paralegal Silva, who starts law school at Harvard in the fall, has found himself becoming a computer "expert" for the firm. "Now that other lawyers in the office have seen what we are turning out, they come to me with reams of numerical data and say, 'Can you put this on the computer?' I explain that it isn't that sim-



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ple. I have to know something about what the lawyer is trying to demonstrating to demonstrate how the numbers are pertinent. After we've talked it over and the lawyer has taken me through the materials," says Silva. "I'm in a position to stast settlement, but the ple, for a civil rights case I've done stantitical graphs analyzing an employer's past employment practices. They show the procentage of women and minority group members hired, how long they termined in their jobs, the history of their promotions, and so on."

Tax Alternatives

Downtown at Fried, Frank, Harris, Schriver & Jacobson, tax lawyer Joel Scharfstein talked his law firm into buying an IBM PC "without having a specific project in mind—just because I knew it would be useful."

And useful it is. At first, Scharfstein used 1-2-3's spreadsheet function to help his clients plan for the alternative mini-

mun tax. With 1-2-3, he could thow dients how his legal advice would affect the bottom line without having to call in accountants. "1-2-3 prevents us from accountants." 1-2-3 prevents us from 19-3, "Normal Centrol." For the conspay. "Normal Centrol." For the control of the conwith him and uses 1-2-3 on his own IBM PC, which is hooted up to Lexis, they presearch database subscribed to by his from.

Student Problems

In academia, Harvey Dale, a professor at New York University Law School, has not yet felt a need for 1-2-3* graphics and prefers what he feels to be the stronger spreadsheet features of Muliplan. At Cadwalader, Wickersham & Taft, where he is counset, Dale uses his own templates and formulas to analyze the tax consequences and financial prospects of lessing arrange-

ments he has structured for clients. "The Multiplan columnar formatting is especially useful for presentations. I like being able to link a number of columns at the top of a spreadsheet so I can have headings running across several columns of figures that each have subheadings," he says.

Dale teaches often by posing problems for his students to solve. For his tax classes, Dale uses Multiplan to structure his typotherical questions so that students can work with realistic figures without having to worny shoot penius was Multiplan does: "what if" calculations that enable Dale to design classroom problems with potential results such as \$100, \$200, and \$200. Depending on which number students arrive at, Dale can tell not only when tractudents' answer are wrong, but also the route they took and where they went off the track.

"I am a certifiable computer freak," says Dule. Fortunately, NYU Lua Wichool has 40 IBM PCs. "just for faculty finger," with 51 more expected next," "For tax questions, you can take good advantage of Multiplan's capacity to solve equations with multiple dependent variences of the computer of the compu

Real Estate Projections
After several years of working with
VisiCale and SuperCale, Martin Cowan,
tax partner at Milbank, Tweed, Hadley &
McCloy, is now learning 1-2-3. "It has a
great deal more potential," he say, feel
lets you put all the information in one
place and then pulse on the place and then pulse
and then pulse of whether you need,
which facilitates record keeping and
access." In the past, when called on to
help design real estate projects attractive
to
concept with his clients and then turned
things over to accountains, who then performed the financial projections and anal-

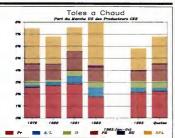


Figure 1: This bar groph, showing the portion of the U.S. morket for hot-rolled steel held by Europeon producers, was created using 1-2-3 for o French client by Chuck Silvu of Windels, Maxz, Davies & Ives.

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yses. Sometimes the result followed his guidelines, but sometimes he was not so sure they did.

Now Cowan can discuss alternate concepts and plug the numbers into 1-2-3 while his clients are sitting in his office. They can all watch how different parame-

Being able to run the numbers myself gives me a better insight into the assumptions made in financial projections.

ters will affect the project as Cowan feeds in varying real estate tax rates, rental income, and interest rates, "I'm concerned with whether a project will be profitable before taxes, so I need to see the critical turning points for profitability. "Being able to run the numbers myself gives me a better insight into the assumptions made in the financial projections," Cowan says. "If the figures are constructed entirely by outside accountants, I have to dig to find out what the numbers represent. Have the accountants built in an inflation factor? What occupancy rate have they assumed? I like to know what the assumptions are and be able to see their effects without waiting days or weeks to get the financial analysis back."

Cowan thinks the templates available for 1-2-3 are great, too, "I found one for just \$15 that will let you print out a Form 1040 if you already have 1-2-3. Now," he says, "if only we could get the extract function to work with its data sorting command . . .

Laura Lou Meadows is a New York Citybased tax lawver with over 20 years of experience. Her IBM PC has increased her productivity.



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Three programs available from MC2 Engineering Software help engineers choose the right heating, cooling, and ventilation systems for houses and commercial buildings.

spent a lot of time this winter watching a thermometer in my house. I was trying to figure out how frequently mack eicked on to maintain a given room temperature. I finally gave up and went south for a vacation. When I came back, I had a program for the PC in my mailbox that will perform such energy calculations with the same scientific rigor as a professional who does this for a living—the HVAC entineer.

HVAC stands for heating, ventilation and air conditioning. For years, HVAC engineering was a quiet profession. But the business changed fast during the 1970s

RLSM Residential Cooling and Heating Load—Manual J Method CLAM Commercial Cooling and Heating Load—ASHRAE Method ENAM Energy Analysis, Systems Simulation, and Economic Analysis MC2 Engineering Software 810′ SW. Tabl. Ave. 425E P.O. Box. 439980 (305) 665-0100 (305) 665-0100 List Priece RLSM, \$295; CLAM and EVAM, \$5095 cast.

Requires: RL5M; 64K RAM, one disk drive. CL4M and EN4M; 128K RAM, one double-sided disk drive. CIRCLE 704 ON READER SERVICE CARD



when energy prices zoomed into the stratosphere. Landlords struggled to perthe fuel bilds of shivering tenants, and many states passed minimum energy efficiency standards for new buildings. As a result, HVAC engineers developed fairly sophisticated analyses of building thermodynamics and energy costs.

To use these analyses requires hours of detailed number crunching with variables such as the construction materials and methods, the building location, and the equipment that will be used to heat and cool it. Sounds like a perfect application for an IBM PC, doesn't it? A number of software vendors are already fulfilling this need. One of the best so far is MC2 Engineering Software, which supplies a family of HVAC programs for the IBM PC and other computers: CL4M Commercial Cooling and Heating Loads-ASHRAE Method: RLSM Residential Cooling and Heating Load-Manual J Method: and EN4M Energy Analysis, Systems Simulation, and Economic Analysis. Bob McClintock, president of the Miamibased MC2, says that his company offers a number of other programs for specialized building applications like airducts, sprinkler systems, or solar energy (flatplate) collectors, but that CL4M, RL5M, and EN4M are the basic programs you need to design a building or to optimize the energy consumption of an existing one.

McClintock has been in the software business for some 6 years. Formerly, he was with Carrier International Corporation, the air-conditioning equipment manufacturer. Parts of the MC2 programs were written by McClintock and the rest by specialists under contract to the company.

All three packages include interactive menu-driven programs with which you can obtain intermediate results. Parts of the programs are fully compiled, while other parts are written in BASICA. If needed, McClintock says he can either provide the source code or work with the user to adapt the program to his or her special needs.

"We compiled parts of the program to increase speed," he says. "Run on a mainframe, the evaluations could be completed in a few minutes, while the typical runtime on a PC is about an hour." The menus do point out many shortcuts that can reduce runtime or the tedium of repetitive data entrys.

RL5M CL4M and RL5M both measure heating and cooling loads, but with vastly different tools. RL5M, which is for houses, is based on an analysis method developed by the Air Conditioning Contractors of America that is known as Manual J. (McClintock used the fifth edition from 1975 but he says a revised edition has since come out, and he is in the process of undating RI5M to comply with it.) You begin using RL5M by dividing the house into zones. It can handle up to 50 rooms, or a house treated as one room. You plug in data about the materials used in the house's construction, its orientation on the compass, and its dimensions. The program then calculates a variety of "heat transfer multipliers" for walls, windows, and roofs. It combines these multipliers with data on the geographical location of the building to obtain values for the needed amount of heating and cooling in terms of BTUs per hour per square foot.

conditioner needed for the house. McClintock says that RL5M is ideally suited to sizing equipment for a house or a condominium. Its limitation is the same as that of Manual J. Many of its standard heat-transfer values, which are taken from the tables in Manual J, don't tell enough about the true performance of building components. That issue, as well as many others, are addressed in CLAM, the commercial-building program.

From these values an HVAC engineer can

quickly calculate the size of furnace or air

CL4M

CLAM takes a much more comprehensive approach to sizing building loads. It is

based on analysis methods worked out by ASHRAE (the American Society of Heating, Refrigeration and Air Conditioning Engineers), as described in Chapters 22 to 23 and 25 to 26 of ASHRAE Fundamentals (1977), the National Bureau of Standards' NBSLD program, and the Carrier Corporation's Handbook of Air Conditioning Design. (Like Manual J, ASHRAE Fundamentals is available in a newer edition-1981. McClintock says he is hustling to get the changes from this newer edition into his programs.)

To use CL4M, you first enter the properties of the building you are designing. You label each room or building section as a particular zone and then key in the properties of that zone. But instead of simply entering dimensions, geography, and heat

CI 4M and RI 5M both measure heating and cooling loads, but with vastly different tools.

transfer multipliers as with RL5M, you must input everything but the kitchen sink: the materials and construction methods of the walls; the types of windows and window blinds or awnings; the dimensions of air snace between the ceiling of one level and the floor of the one above; the amount and type of lighting; the amount of furniture and carpeting; and the number, type, and frequency of use of the doors.

Did you know that female office workers generate only 85 percent of the heat of male office workers? Or that restaurant eaters generate more heat than a roomful of typists? The program calculates different load factors for these different building

The most important factor in determining how fast a building heats up or cools down is sunlight. The program has algorithms that allow you to calculate the sun's position during the year, how the sun's rays enter through the windows, and finally, how much heat this sunlight adds to a

building.

The program does not, however, account for a 30-story skyscraper just south of the charming shoe factory you are converting into lofts. But as McClintock explains, you can get relatively accurate measurements with a simple trick. "Take the subroutine that calculates the shading on a window with a certain type of awning," he explains. "Then put in the dimensions of your building for the window, and the dimensions of the building next door as the awning, and the program will give you an average value for the shading during any particular time of the year." This value can then be coded into the program, and while it won't tell you

the heat transfer of your building's shaded wall is affected by the skyscraper. A number of other values, such as the effects of heavy winds on the air leakage through a wall, are also not accounted for by the program, but McClintock says they are readily available from engineering handbooks and can be entered into the

what windows are in shade and which are

in sunlight, it will tell you to what extent

overall calculations "There are easily over 100 data points for each building zone in the program and there can be dozens of zones in a large building," notes McClintock. Keying all of these data points into the PC could take days, but he says the program permits a number of shortcuts. For instance, since many zones are similar or even identical, you can repeat all or most of the data points for one zone in another zone. You can also rotate a zone from, say, the north side of a building to the south, the subrou-

late the changed heat load. The whole building can be rotated as well. Ultimately, the program calculates the maximum heating and cooling loads for a building. With these in hand, you can then size the air conditioning system and boilers as well as the ductwork leading to each

tine for sunlight will automatically calcu-

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zone. With CL4M, you can play around somewhat with alternative designs to see how, for instance, light-reflecting glass would aid in keeping the building cooler.

However, if you are looking for a more rigorous analysis of building energy economics, you should turn to MC2's third product, EN4M.

EN4M

While CLAM calculates how hot or cool a building becomes, ENAM determines how best to meet those heating and cooling loads. Although best suited to existing buildings that are being examined for potential energy savings, it can also be used to see how new building design chances would affect energy costs.

In either case, you enter the temperatures at which the building will be kept, its geographic location, its cisting or prosoled HVAC system, and the cooling and heating loads on the building. As in RSM, you breath the building into zones for which the program calculates individual and loads. A speament subprogram develual loads, a log-parts subprogram of the log-parts of the log-parts of the run a baseline case to determine the opertation of the HVAC system, another subprogram can perform an energy and cost analysis.

You can input up to seven proposed designs during one run. The program recomputes full energy and economic analysis for each design to see what the net cost effects are. It will tell you, for example, which is more cost effective: moderning an an existing boiler, or ripping it out and putting in a new one. It can handle much more complex problems as well, incorpo-

rating data from the weather profile.

RL5M, CL4M, and EN4M—include printing instructions that McClintock says can interface with commonly used printers. He also says that he offers program updates—for new types of computers or for new analysis methods—at the cost of the replacement disk and shippoine.

These days, I'm back to watching my hermometer and enjoying the moderate temperatures of a New York spring. As I think about the approaching summer and the wheezings of my Model I air conditioner, I wish that my building 's designer had had tools like these programs when my apartment was built.

Nicholas Basta, who was trained as a chemical engineer, is a New York-based technical and business journalist.

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Well Schooled In 1-2-3

Integrated software packages such as Lotus' 1-2-3 can enhance school management and offer administrators a powerful alternative to packaged educational-management software.

chool administration tasks such as keeping track of student attendance; class lists; teacher assignments; erade computation; achievement-test results; budgets; and forecasting pupil, staff, and program changes easily lend themselves to commercially available software programs. One example of an integrated software program that can help school administrators carry out these tasks is 1-2-3 from Lotus Development Corporation, in Cambridge, Massachusetts, 1-2-3 provides spreadsheets, graphing, database management, and word processing-all using a single set of program commands.

Enrollment projections, a necessity for long-term planning, are derived from simple calculations using historical enrollment trends. Retention ratios developed from these calculations indicate the percentage of the pupils at one grade level who move on to the next grade level. Using 1-2-3's spreadsheet, district or school enrollment for grades kindergarten through 12 is entered for each of the past 5 vears. Retention ratios are calculated between each successive grade for each of the 5 years, 1-2-3's AVG function provides an average retention ratio for all grades over the entire 5-year period. This average is then used to calculate future enrollment by grade level and year. 1-2-3's COPY command can save time with



have been completed, a new section of the spendabert is used to construct a time of enrollment projections for the next 5 years. The projection table can be used again the following year mercil by adding the most record mentilens the guest about the strain of the projection of the

What If?

The "what-if" questions so popular with computer spreadsheet users are also useful for enrollment projections. If, for

example, a school planner decides that in a retention ratio greater than the average of the past 5-years, the ratio can easily be changed in the model, which yields a new set of projections. A process that would have consumed days of manaual planning time can now be accomplished in a few beare.

Staff and pupil planning can also benefit from 1-2-3. Administrators typically begin thinking in May or June about the organization and structure of their schools for the next school year. How many classections will be needed for next year? How many teachers? How many teachers? How many teachers?

EDUCATION

issues can raise the quality of planning. It's easy to develop a "school classroom, section, and teacher" projection to enable administrators to answer these questions based on a number of different assumptions. For example, if the top administration and board of education of a district decide that class size must increase or decrease because of budget concerns or a reallocation of resources, obviously the number of class sections at all grade levels will have to change. 1-2-3 conveniently allows the school planner to see what would happen if class size is altered, and what the impact of such changes would be on the number of pupils in each class sec-

The model developed with 1-2-3 calculates the number of students in a school, the number of classrooms available, the number of classrooms needed, and the average class size for the school. In addition, the model calculates the section size for each grade level based upon the projected grade-level enrollment. This

1-2-3 can be a powerful and flexible management tool for the school executive.

calculation is accomplished by taking advantage of 1-2-3's powerful macro function. Alt-letter key combinations can be used to divide the number of students in a particular grade by the number of sections the administrators desire. resulting in a breakdown of pupils by section.

1-2.3's database management components norme than adequate for the needs of the typical school executive. Attendance executive, present same the developed by entering student names and recording their attendance. From this simple database, a list of absentees can be generated as a daily or weekly basis. This relationship statementary attendance system cannot compare with recently introduced school attendance systems that automatically generate effects to puerous and maintain comprehensible than the control of the statement of t

Database Management

School administrators can also use the database component of 1-2-3 to store pupil achievement-test information. Most



schools use permanent record cards to maintain this information and store it away safely in a file cabinet. The information is generally not readily available to the administrator, and often it is not organized in ways that make it useful for instructional and program planning. Storing test information on a 1-2-3 file, on the other hand, allows you to easily query the database. All pupils with a below average score in reading or math, for example, can quickly be identified. In fact, using the DATA/OUERY command. achievement-test data can be analyzed in any number of ways.

Mainframe computers are another traditional method of generating school achievement-test data. They are quite good at collecting the data, but notoriously bad at presenting it in a readable and understandable form. Although the computer-scoring divisions of major testing companies such as CTB/McGraw-Hill have spent a great deal of money and effort, teachers and parents continue to have difficulty with the test reports they provide. Some school districts have the facilities to score their own tests, but the packaged scoring programs they use generally do not lend themselves to locally designed reports. You can use 1-2-3 to design a special, individualized testing report complete with tables, charts, and graphs. After the test-report format is developed, principals merely update the report each year as new data become available. Principals can thus computerize their school's test data in a way that readily allows for a longitudinal assessment of a school's programs and its student's perfor-

School administrators often have to

mance.

create other kinds of presentations too, and 17-23's word processing function can help. Although the word processor in 17-23's in sto sophisticated or powerful, it can bod it so win for writing short documents. WordSur or another full-featured word processing program would be more appropriate for writing long test reports or creating annual reports that are sent to thousands of households, but 1-23 is convenient to use for brief explanations of a graph or chart in a report, or to write memorandums.

Size Limitations

The school administrator working in a small school or district will realize the most benefit from 1-2-3. The largest database you can construct with 1-2-3 on an IBM PC with 256K holds about 150 elements with 6 fields each. Although it is



5660

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EDUCATION

possible to develop multiple databases related to the same information (such as achievement-test scores), large schools may find 1-2-3 insufficient to meet their database needs unless a hard disk is available.

1-2-3 solves the problem of having to learn a variety of sophisticated computer programs for job-related tasks.

Lotus' 1-2-3 solves the problem of having to learn a variety of sophisticated computer programs before applying a personal computer to job-related tasks. Although some training is necessary before using 1-2-3, the utorial disk and a few days of experimentation will get most individuals off to a good start.

1.23 can be a powerful and flexible magnetic tool for the schole received. The uses to which 1.23 can be applied to the schole are finited only by the imagination of the people who use it, Administrators are beginning to utilize the popularitors are beginning to utilize the point and of microcomputers in school operations as they discover the advantages and cast of successions and the school of the school operations as they discover the advantages and cast of the productivity and productivity of administrators as they continue to discover the school operations.

Edward Lynn is the Director of Special Projects at the Wappingers Central School District in Wappingers Falls, New York. He has been working for several years on adapting microcomputers to school administration tasks.

Milking the \$ Cow

Bank of America's sophisticated MicroStar package is carefully tailored to help the cash manager wring the last cent of investment interest out of bank and corporate megabucks.

maging money for banks and large corporations centuals considerable grant work. Not only are treasury department cash managers responsible for squeezing every possible for squeezing every possible retheir control, they are expected to do so with maximum efficiency and minimum risk. To maximize interest income they must keep track of numerous bank accounts scattered all over the country of the world, of a slee world song-term investments, and of interest rates for a wide range of investment in the control on the control of the country of the world, of a slee world song-term investments, and of interest rates for a wide range of investment instruments.

Until recently, for their vital statistical information these cash managers depended on large data processing departments and centralized sources that accessed other

MicroStar Bank of America

c/o Jim Putnam 555 California St. #5629 P.O. Box 37,000

San Francisco, CA 93137 (415) 953-7171

List Price: \$9,500 including installation, customization, and training. Support, \$295 per month.

training. Support, 5295 per month.
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CIRCLE 706 ON READER SERVICE CARD



mainframe computers. Now, the PC can help them make financial judgenests without waiting in line to access a terminal and without incurring the substantial cost of time-sharing services. With a PC and a comolex soreadsheet

and communications package called MicroStar, what was once a labor- and timeintensive operation that required platoons of clerks can now become the work of one person.

The giant California-based Bank of America designed *MicroStar* for its own use, but now sells it to other organizations that must handle millions of dollars.

The package breaks the key components of cash management into workable

chunks and translates them into a series of procedures performed on a PC.

The MicroStar system was developed for Bank of America's internal use, according to Jeanette Whitemore, making manager for the system. "There are numerous standards in the banking industry, and the software was developed around them. We spert a great deal of time working all the kinks out of the product. Once we had it up and running we realized we had a generic tool that manageres could benefit from."

"A lot of what the PC does now was once done on paper," says Chris Winter, the bank's vice president of treasury department services. "Imagine the amount of work that was involved in transferring the details of 20 corporate bank accounts from one set of ledgens to another. The PC frees managers for higher level functions, like selecting the day's best investments."

Interlocking Modules

MicroStar is composed of interlocking modules, each designed to handle a major cash management job function or help sort and organize data. The six different core

modules read and write data to one another. They are:

• MicroPlan. Chang Laboratories's so-

phisticated spreadsheet program;

A daily cash projection worksheet that



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FINANCE

helps organize data for projections;
 A daily transaction journal for posting

- transactions;

 A consolidated balance report, for pool-
- A consolidated balance report, for pooling the day's entries;
 A communications program, which
- includes auto-dial and automatic call-up software that obtains account and other data from bank and other outside databases;

 • A menu processor, which connects all
- these options and creates a series of menus and submenus for accessing them.

More than just the sum of its medules, MicroSur also includes WordSur, for writing reports, and a ready-made database format writine in aBASE II that holds the account and investment information used for daily can management decisionmaking. All of its parts are completely integrated and howe many banking indutry standards, codes, and communication by the logical sequence of tasks and the communication of the standard or treasurer performs each day is also built in.

For example, a copporale treasurer might need to report the earnings of half-a-dozen company divisions, each of which has five a rome separate bank accounts. These 30 accounts might be anywhere in the United States. The treasurer must know the balance in each of these accounts today, make an accurate forecast for ionizorous, and make projections for the contract of the contract o

Daily Routine

Thus, rather than a main menu that lists the core modules, the user is presented with a main menu that follows a cash manager's five-step daily routine. It offers the following choices:

Communications (for collecting and printing account balance data);
 Account Data Entry (for keying in balance data not automatically entered by

- Daily Processing (for posting data to today's worksheets);
- Daily Processing, Optional (for updating worksheets later in the day, as necessary);
 - End of Day Processing (for filing worksheets and preparing for the next day).

The giant Californiabased Bank of America designed MicroStar for its own use but now sells it

to other organizations that must handle millions of dollars.

The user chooses an option by number, which leads to another menu, a submenu, a worksheet, or a processing operation.

- Under the communications option, MicroSur's stud-off leature eliminated in the tedious job of dialing different bank timesharing systems to accumulate the sacross all dial-up, instructions and automatically outstrated in the sacross and the instructions and automatically outstrated in the terminal sessions to the user's specifications. MicroSur-can be left unattended to make its calls during the night when phone rareas are lowest and can have the collect data available when the treasurer arrives in the morning.
- All account data that MicroStur recives in BAMTRAC, the Bank of America's system format, or from banks that are members of National Data Corperation, isentered automatically. Non-BAMTRAC account data is printed out so that it can be annually entered using the Account Data Entry option. The program converts this manually keeped data to the BAMTRAC format for posting to all appropriate worksheets.

Under the Daily Processing option

MicroStar):

FINANCE

MicroStar includes a number of templates and worksheets. Templates are customized sets of headings, rows, and columns for a spreadsheet combined with a programmed set of instructions. Usually they are created once and left unchanged for long periods of time.

Worksheets function like scratchpads on which cash managers arrange and rear-

A cash manager now has more latitude to take risks and get more attention from upper

management.

range data to suit their needs. For example, a Target Balance worksheet can be used for monitoring cash position and managing bank relationships. The template remains unchanged and ready to be recalled, while the worksheet is the daily electronic scratch sheet, financial forecast, and model.

Under the Daily Processing option, a submenu offers six categories: 1: Target Balance; 2. Daily Cash—Summary; 3. Daily Cash—Detail; 4: Consolidated Balance; 5. Intracompany Funds Flow— Detail; and 6. Intracompany Funds Flow—Summary.

The user copies the template for each category to use as a worksheet. Throughout the day, information is collected from various companies and banks, and the different worksheets are updated.

Under the End of Day Processing option, the user neets the communications files for tornorrow's automatic calls, moves the day's balance information into a history file, copies worksheets to a diskette, and recopies the templates for tomorrow's postings. The cash manager finishes the day's routine by putting MicroStar in its Unattended Automatic Callin mode.

Delegating this enormous mountain of

detail to MicroStar gives the cash manager more time and information with which to review the projections of receipts and disbursements and decide how best to use the day's available funds.

Industry Changes

Marketing manager Whittemore believes that there has been a shift in the job definition of the cash manager in treasury departments. What was once just a tedious job has now become a "growth" position. A cash manager now has latitude to take risks, gets more attention from upper management, and is more likely to be promoted up the corporate ladder.

Training such high-level decision makers is increasingly important. Bank of America packages *MicroStar* with a suport contract and a 5-day training session that teaches cash managers to use both the

PC and the program.

"The 5 days of training are rugged,"

says Chris Winter, "particularly for managers who have never touched a PC. They tell us after it's all over that they've been through an ordeal: we throw an awful lot of information at them in that week."

Launy Franzoni, managing editor of Electronic Funds Transfer, the cash management industry's trade newsletter, says: "Banks are really taking to PCs and saying on time-sharing costs, which can easily amount to \$3,000 per month for each cash manager's use. That kind of savings pays for an XT, the training, the customized applications programs, and the support."

Bank of America's MicroStar is one more indicator of the financial community's new philosophy. Once the staid guardians of long-term deposits, banks such as Bank of America are now exploing new and fertile marketing ground with entrepreneurial zeal. Taking a cue from more established software marketers, Bank of America from hear as toll-free takparation of the stail dispatched from the bank to steer customs.



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SIDEWAYS

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New On The Market

HARDWARE

Frame Editor

A hardware/software graphics package, intended for use with a digitizing tablet or optical mouse and a Verticom 200 graphics monitor. The package is designed to use an IBM PC's systems unit as its CPU, to which is added the Verticom hardware. The software allows the user to create free-form graphics designs utilizing squares, circles, rectangles, and other geometric forms. and makes use of up to 16 simultaneous colors chosen from a palette of 4096. Frame Editor is compati-

ble with the North American Presentation-Level Protocol Syntax (NAPLPS) standard, designed to mix graphics and text in an efficient, hardware-independent format

(List Price: With Verticom 200 Terminal, Digitizing Tablet or Optical Mouse

Tablet or Optical Mouse \$7,450) Requires: 128K RAM, one disk drive, PC-DOS.

Verticom Inc. 545 Weddell Dr. Sunnyvale, CA 94089 (408) 747-1222

CIRCLE 737 ON READER SERVICE CARD

Interface DiskSystems

A line of Winchester 51/4inch hard disks, consisting of nine models with format-



Frame Editor, Verticom Inc.

ted storage capacities of 10.6, 15.9, and 25.1 megabytes. There are models for use as central storage devices, or as system slaves, in external or internal use configurations.

All of the DiskSystem units feature a track-to-track access time of 2 milliseconds. The 10- and 15-megabyte units have an average access time of 85 milliseconds, with the 25-megabyte offering an average access time of 54 milliseconds.

Each DiskSystem drive includes an IBM-compatible controller (if required), standalone cable to internal mounting hardware, cable, power supply, connectors, and I/O adapter.

(List Price: Main Storage Models: 10MB \$1,495; 15MB \$1,795; 25MB \$2,295; Slave Models: 10MB \$1,185; 15MB \$1,385; 25MB \$1,985) Interface Inc.

7630 Alabama Ave. Canoga Park, CA 91304 (213) 341-7914 CIRCLE 738 ON READER

M68000 Single Board

Computer
A hardware/software package that interfaces with the
user's system, allowing the
user to develop and debug
programs for systems incorporating an M68000 microprocessor. The hardware

consists of a standalone sin-

gle board computer (SBC) equipped with a 6MHz or 10MHz M68000 CPU, 20K of RAM, 16K of EPROM space, two RS-232 ports, a 16-bit parallel port, five 16-bit counter-timers, and an expansion bus to allow for

memory and I/O expansion.
The included software consists of the M68KXAS Macro Cross Assembler, which can assemble source files created by the user's system into code acceptable to the M68000 microprocessor, using standard M68000 more monics. The object file generated by the assembler is formatted to allow downloading from the user's system to the development system.

The M68000 IC chip on the single-board CPU supervises the downloading operation, which is performed using one of the R8-232 ports. Once downloaded, the user's program under development can be tested and debugged, and the corrected program saved back to the user's system. (List Price: 6MHS 7395). Educational Microcomputer Systems.

P.O. Box 16115 Irvine, CA 92713 (714) 553-0133 CIRCLE 742 ON READER

SERVICE CARD UltraPAK

A multifunction plug-in board offering enhanced graphics capabilities, a parallel port, one or two serial ports, and a clock/calendar with battery backup. Additional options include an IBM disk controller, with or without 256K RAM: 384K of added RAM with an electronically emulated disk drive; and a choice of IBM color graphics or high resolution (640 × 400 dot) graphics in 16 simultaneously displayable colors. (List Price: \$795) Tsene Laboratories, Inc. P.O. Box 566 Newtown, PA 18940 (215) 968-0502 CIRCLE 739 ON READER SERVICE CARD

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IDS 0.440 MODERN
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naur cana transmission.

The model G240 limited-distance modern provides asynchronous operation at data rates of up to 4800 baud over loaded lines, and up to 9600 baud over non-loaded lines. Two strap-se-lectable transmit levels meet AT&T 43401 and 41004 specifications. Other features include analog loop-

back, remote digital loopback transmit pattern, and the ability to inject deliberate errors to provide verification of a network's perfomance. Six LEDs monitor the status of key interface signals and the digital loopback. A lockout feature protects the loss of synchronization between the network's master system and

remotes.
(List Price: \$400)
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Lincoln, Rl 02865
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(401) 333-6200
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SERVICE CARD

ST3703 Network Processor

A unit permitting up to 12 separate personal computers, terminals, or other serial line devices to be linked to a mainframe system using IBM's System Network Architecture (SNA) protocol. Other networking protocols supported by the ST3703 Processor include the Amdahl, Natsemi, and Facom systems. The networking device features a dynamic protocol processor (providing a hardware-independent channel of communications with the mainframe system as a Physical Unit Type 2). coupled with a host support program and downline mul-



M68000 Single Board Computer, Educational Microcomputer Systems

HARDWARE

ti-function capability. (List Price: unavailable at press time Systems Technology Ptv., Ltd. Office of the Australian Trade Commissioner 636 Fifth Ave New York, NY 10111 CIRCLE 740 ON READER SERVICE CARD

V1000 Voice

Response System A device permitting the user's system to respond vocally to queries made over phone lines, and to make vocal outgoing calls to a user at a remote location. The device can provide up to eight communications channels for voice or data transfers that can be configured under software control. Available ontions include a choice of a 300-baud Bell 103-compatible or 1200baud 202-compatible modem, GPIB (IEEE 488) sup-

port, or IBM 3270 support.

The V1000's voice re-

sponse capability is based on adaptive differential pulse code modulation. which gives the device a virtually unlimited, user-defined vocabulary. Optionally available is a preprogrammed vocabulary library of 1,300 words, developed using linear predictive coding voice-synthesis techniques. A user at a remote location can query the system, make updates to a database, modify a program



V1000 Voice Response System, Vynet Corp

flow, etc., using Touch-Tone code signals from a standard Touch-Tone phone.

Packaged in an enclosure having the same overall dimensions as the IBM PC's systems unit, the V1000 can he stacked with the user's system for a compact arrangement. The device connects to the user's system via a ribbon cable that plugs into a single expansion slot. A 256K RAM expansion ontion is available to hold additional speech or program data for very large applications. (List Price: 8-channel unit \$7,315)

Vvnet Corp. 160B Albright Way Los Gatos, CA 95050

(800) 538-7002 (408) 370-9764

(408) 370-0555 CIRCLE 748 ON READER

SERVICE CARD

ASCI AMI Port

Switches

A line of switching devices allowing from eight to 32 RS-232 data lines to transmit to one RS-232 output port. The devices are intended for use in applications where it is necessary for a number of sources to input data to a single monitoring CPU.

Because the ASCI AMI units simultaneously monitor all input lines, each device linked to the switching center can control the output port as needed, without requiring the CPU to continuously poll every input device linked to it. Transmis-

sion is hidirectional and baud rates from 150 to 19,200 are supported. (List Price: \$1.843 to \$4,395, depending upon number of ports) Advanced Systems Concents Inc. 435 N. Lake Ave. Pasadena, CA 91101 (213) 793-8971 CIRCLE 750 ON READER

Turbo Stick A joystick offering high

pointing and cursor-repositioning speed, high resolution, and full RS-232 ASCII output for simplified interfacing with the user's system. The handle of the Turbo Stick incorporates two fingertip-activated microswitches that allow the user to switch between an absolute mode with high pointing speed, and a rate mode with high resolution. The switches can also be redefined under software control (List Price: \$395) KA Design Group

6300 Telegraph Ave. Oakland, CA 94609 (415) 654-6300 CIRCLE 745 ON READER SERVICE CARD

IDEAdisks

A line of 3.9-inch Winchester hard disks, available in formatted storage capacities from 5 megabytes to 40 mcgabytes. The line includes both internally- and externally-mounted units, in

fixed or fixed/removable cartridge configurations. Externally mounted units include a separate power supply in an enclosure designed to complement the user's system.

The IDEAdisk line includes the following models: 10MB internal, designed to fit the space of a full-height floppy drive; two 5MB fixed external units, with or without a removable 5MB cartridge: two 10MB fixed standalone units, with or without a 5MR cartridge: two 20MB fixed standalones, with or without a 5MB cartridge; and two 40MB fixed standalones. with or without a 5MB cartridge backup. Each IDEAdisk unit includes interface. as well as support software and mounting hardware. (List Price: \$1.495 to \$5,295, depending upon storage capacity and configuration)

IDE Associates Inc. 7 Ook Park Dr Bedford, MA 01730 (617) 275-4430 Telex:94 8245 CIRCLE 741 ON READER SERVICE CARD

PCterminal

A disk-less intelligent terminal that can be used in place of a standard IBM PC in a PCnet local area network application. The terminal has a monitor, keyboard, an 8088 microprocessor, both a serial and a parallel port,



IDFAdisks, IDF Associates Inc.



PCterminal, Santa Clara Systems, Inc.

four expansion slots for peripheral boards, 64K of RAM (expandable to 256K), built-in networking capabilities, and a connector for an optional 51/4-inch floppy disk drive. The optional disk drive permits the PCterminal to run programs

locally as well as over the network.

PCterminal operates under both PC-DOS and a proprietary operating system, SCS-DOS, A special PCnet protocol permits the terminal's operating system to be initialized from another PC on the network, and to communicate over the network without a disk drive. PCterminal incomorates all necessary PCnet hardware, and includes a remote execution feature permitting the terminal to run a command on another system linked to PCnet as if the command had been entered on the other system's own keyboard. (List Price: \$1,295)

Requires: PCnet Local Area Network Santa Clara Systems, Inc. 1860 Harton Dr San Jose CA 95131 (408) 287-4640

CIRCLE 747 ON READER SERVICE CARD

Model 430 Mini

Drivers

A device for transmitting data over limited distances using two twisted-pair wire cables. The devices, small enough to hold in the palm of one's hand, operate asynchronously over full-duplex, four-wire circuits at speeds of up to 19,200 baud at a distance of over one mile Transmission distances increase to up to 18 miles at 110 baud (depending on specific operating conditions and wire thicknesses).

The Mini Drivers plug directly into an RS-232 port in the user's system, and do not require additional power supplies or special configuration procedures. The drivers are packaged in cartons

MICRO MATCH llardware ccessories

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Telex Manager, Braid Communication

and outgoing messages; a directory of frequently called telex numbers, which can be referenced with simple abbreviations; timed transmissions, which can take advantage of periods when rates are low and lines unengaged; and automatic receipt and acknowledgement of incoming messages, which can be either immediately displayed or stored to disk for later review. (List Price: \$1.695) Requires: 128K RAM, one RS-232 line, one or two tel-

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Accelerator PC A 10 MHz, 8086 coproces-

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Bundled with the Accelerator PC board is Pseudo-Disk software, which can speed access to a user's stored data, and a print spooling utility. (List Price: 128K \$995) Titan Technologies, Inc. 310 W. Ann St. Ann Arbor, MI 48104 (313) 662-8542

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MFX-100 Floppy Drive Analyzer A microprocessor-based

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StorageMaster 409, Control Data Corp.

repair, and production floor testing.

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The MFX-500 provides total drive testing by means of its full step, write data, and read data capabilities, which include margin testing. The formatting/verifying of diskettes in the IBM standard format is a standard feature of the unit. (List Price: \$2.495) Wilson Laboratories, Inc. 2237 N. Bavaria St. Orange, CA 92665 (714) 998-1980 Telex: 18 1598

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The English Machine An artificial intelligence starter kit that allows nontechnical users to operate BASIC programs in plain English. The software reduces the need for user training, as it employs a number of artificial intelligence techniques to commu-

nicate with the user.

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lows the user to reach up to 40 BASIC subroutines using a vocabulary of up to 150 words. It has a dynamic grammatical structure, permitting the user to change the interactive interface without changing the underlying codes. (List Price: \$119 95) Requires: 64K RAM (PC-DOS 1.1); 96K RAM (PC-DOS 2.0); one disk drive. Babbase and Lovelace 1955 Bel-Air Dr. Ottawa Ontario K2C 0X1 Canada

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An interactive menu and help facility that provides on-screen instruction for all PC-DOS 1.1 and 2.0 commands. A built-in fullscreen editor allows the user to modify the given menus of help information, or to



PEED READING . . . The Computer Course

create entirely new menus. The program can be automatically called up from AUTOEXEC BAT. Two operational modes are used a Command mode and a Menu mode. In Command mode, the user enters the name of the command for which information is needed. The software then displays a short, one-line summary of the command at the top of the screen. The command name is automatically entered and, if there are no additional input requirements, it is automatically executed. In Menu mode, the list

In Menu mode, the list of commands is displayed on the screen. The user selects a command by moving a highlighted area using the cursor control keys. Once a command has been selected, the menu disappears, and the command description is highlighted at the top of the

screen. As with the Command mode, the command will then be automatically executed

will then be automatically executed Menus can be modified or new menus added to the program, using the software's built-in editor. Menus include all MetaMenu commands, help for all PC-DOS commands, a user's manual, and a quick reference manual on the diskette. (List Price: \$40) Requires: 64K RAM, one disk drive, PC-DOS. P Williame 1470 Farnsworth Ave. Ottawa, Onterio KIH 7C3 Canada

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An interactive tutorial program on speed-reading techniques consisting of eight half-hour lessons. The software is designed to double the user's reading speed. Moving from lesson to lesson, the software provides an understanding of speedreading theory and basic techniques while imparting these skills to the user through drills.

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Requires: 96K RAM, tw disk drives, PC-DOS. The Bureau of Business Practice 24 Rope Ferry Rd. Waterford, CT 06386 (203) 442-4365

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Transtar 315 Color	\$499.00

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CIRCLE 163 ON READER SERVICE CARD

. 7

\$1049.00

may present a problem.

The program is compatible with the BASIC Interpreter, BASIC Compiler, Macro Assembler, the Cobol Compiler, and with WordStar. The program's install function chooses the toggle display location on the screen, and if any conflict with particular software arises, reassigns the location. Once executed, the program becomes resident and will function until the system is reset. (List Price: \$15) Requires: 64K RAM, one disk drive, PC-DOS. RAMSYS Microsystems 225 W. Broadway, #500 Glendale, CA 91204 (213) 507-8076

CIRCLE 725 ON READER SERVICE CARD

Practical Accountant A menu-driven accounting program designed for small businesses. The program handles receipts, deposits, credit card transactions, accounts payable, accounts receivable, and simple payroll. A running balance column constantly displays current cash, accounts payable, accounts receivable, a projected balance, and a reconciled balance. In addition, the program prints checks with vouchers and gives detailed cash flow reports that can be viewed on screen, printed, or used as text files with other programs.



StoreMunder Software Series, Atrasof

A chart of accounts can be defined with 50 income/ expense categories and 400 subcategories. Tax classifications can also be defined for tax purposes. Features like a single-entry format menu, on-screen printing, and the use of the function keys to enter commands are designed to make the program easy to use.

(List Price: \$149.95)

Requires: [28K RAM (PC-

Requires: 128K RAM (PC-DOS 1.1); 192K RAM (PC-DOS 2.0); one disk drive. Softlink Corp. 3255-2 Scott Blvd. Santa Clara, CA 95051 (408) 988-8011

CIRCLE 721 ON READER SERVICE CARD

StoreMinder Software Series

Three programs for retail businesses. The individual programs, which can run individually or as an integrated system, are: SalesMinder, a point-of-sale programs, StockMinder, inventory management software; and MailMinder, a mailing list/customer profile program.

Features of the StoreMinder Series include bar code reader input capability; preset multiple price levels; custom price-label printing; the ability to handle fractional quantities of items; assignment of unique commission rates for each item; and user-selectable multiple terminal overation. The software can also provide the retailer with a profitability index (Gross Margin times Return on Investment). (List Price: Unavailable at press time)

press time;
Requires: 192K RAM, one
disk drive, hard disk, PCDOS 2.0, parallel port, optional serial port.
XtraSoft
553 Weddell Dr.
Summyale, CA 94089

(408) 747-1400 CIRCLE 759 ON READER SERVICE CARD

InteSoft

An integrated software series consisting of five programs: InteBase, InteVate, InteCalc, IntePlan, and IntePERT. InteBase is a database management system





Basic





Compare Plain English to any other language, as shown in the charts above. Eliminate the complexities and rigid structures of the **old** traditional languages.

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with multiple window capabilities. In concert with Inte-Vate, an applications generating component, the system allows the user to create automated procedures in such areas as bookkeeping, payroll, project planning, inventory control, and sales analysis.

The InteCalc financial spreadsheet component of the series can access any information entered via any other component in the series. The spreadsheet also has split-screen and multiple-screen display capa-

hilities. The IntePlan component provides the series with executive time management facilities. It organizes schedules and calendars, displays agendas, and maintains up to nine separate accounts for totalling income received, amounts paid, hours worked for a particular client, and so on

Finally, the IntePERT critical path method component, when used in conjunction with the other components, can project consequences of resource and schedule changes and chart which tasks require which resources, how many resources are needed, and for what periods of time, in calculating and/or analyzing a project.

(List Price: \$149-\$495. depending upon program: three-program set \$495) Requires: 128K RAM, two

disk drives, PC-DOS. Schuchardt Software Systems. Inc.

515 Northeate Dr. San Rafael, CA 94903 (800) 421-1144 (800) 421-1145 in Calif. (415) 492-9330

CIRCLE 720 ON READER SERVICE CARD

SIGSTAT A statistical analysis package, based upon the BMD statistical package. SIGSTAT provides a range of statistical procedures for data presentation and analysis. The software incorporates 32 separate programs, including univariate and multivariate analysis of variance and covariance (including repeated

measures); general linear models; regression (multiple, stepwise, best subset, ridge, polynomial, periodic and harmonic, nonlinear least squares): factor analysis (three rotations, capable of producing factor scores); canonical correlations (produces canonical vari-

ables): discriminant analysis (multi-group, stepwise); life table and survival rate: time series (autocovariance and power spectral analysis): and probit, cross-tabulations, chi square, log linear, residuals, histograms, scatter plots, and data transformations

SIGSTAT can handle up to 80 variables on 32,767 cases, including pairwise

and listwise deletion options for missing variables. Also available is support for the 8087 math coprocessor. (List Price: \$325) Requires: 128K RAM, one disk drive, PC-DOS. Significant Statistics 3336 N. Canyon Rd. Provo. UT 84604 (801) 377-4860 CIRCLE 723 ON READER

The Auditor A spreadsheet enhancement program, permitting the user

to display and analyze the formulas used within a spreadsheet. Formulas are displayed in an easy-to-read grid; long formulas can be wrapped to the next line for reading. Each page is numbered and is displayed with column labels and row numbers for easy reference.

The Auditor is compati-

ble with VisiCalc. Lotus'

1-2-3, and SuperCalc, 1-2-3 users also get a complete listing of all named and other special ranges contained in their worksheets along with the standard formula display. (List Price: \$99) Requires: 128K RAM, two disk drives, PC-DOS. spreadsheet software. Consumers Software Inc. 314 E. Holly St., #106C

Bellingham, WA 98225

(800) 645-5501 (604) 688-4548

SERVICE CARD



The Auditor, Consumer Software Inc.

STAR FLEET I

The first program in a game software series designed around a starship fleet concept. The player becomes an officer of STAR FLEET. commanding one of 35 galactic heavy cruisers. The cruiser, with a crew of 500. patrols a sector of space encompassing 13 star systems. Game missions include rescuing other ships and star bases from attack by enemy craft, capturing and towing enemy vessels, laving mine fields, searching for saboteurs, and repairing damaged ship's systems while maintaining crew morale and espirit de corps. The game makes use of color screens, animated battle sequences, music, and strategy planning. All commands are made with function keys.

(List Price: \$49.95)
Requires: 96K RAM, one
disk drive, PC-DOS 1.1,
monochrome or color/
graphics adapter, BASICA.
Cygnus
P.O. Box 57825
Webster, TX 77598

(713) 486-4163 CIRCLE 762 ON READER SERVICE CARD

EasyE-COM
An electronic mail program
used to transmit letters via
the U.S. Postal Service's ECOM system. After the user
has prepared a letter with
any word processing program, the disk files contain-



EASYMED, Medical Computer Consultan

ing the letters and addresses are processed by EasyE-COM and a submittal file is generated containing all required E-COM control blocks, formatted addresses, and text blocks. This file is then transmitted to the Postal Service using an included asynchronous communications program and the user's modern.

EasyE-COM also includes an integrated accounting feature, making it possible for the service-bureau user to accurately track the costs attributable to clients for which the E-COM letters are prepared. (List Price: \$450; demo disk \$35) Requires: 64K RAM, one disk drive, PC-DOS, serial port, Hayes Smartmodem or equivalent. Easy Soft, Inc.

601 W. Fifth St., #650 Los Angeles, CA 90017 (213) 838-2367 CIRCLE 714 ON READER SERVICE CARD EASYMED

generation.

EAST IMED
A medical office management program capable of maintaining records for up to 32,000 patients. Features include a time scheduling capability, which can produce schedules for doctors and/or examining/operating rooms; automatic generation of patient recall notices; word processing facilities; and automatic patient statement or insurance form

For following up on delinguent accounts, EASY-MED prints all past due balances with the guarantor's telephone number, charges, and insurance details. Collection reports list charges, payments made, and insurance information for accounts sent to collection. An Accounts Recap report monitors the collection agency's progress. Charge and cash analyses list all transactions posted between specified dates, permitting the doctor or accountant to analyze the practice at any time. (List Price: \$2,495) Requires: 128K RAM, one disk drive. 10MB hard disk. PC-DOS Medical Computer Consultants

Morristown, NJ 07960 (201) 539-3833 CIRCLE 763 ON READER SERVICE CARD

95 Madison Ave

Math Maze

A math game for children. where the player must maneuver a fly (the cursor) through intricate passages to escape a spider. The fly is safe as long as the child correctly answers problems in addition, subtraction, multiplication, and division.

To begin the game, the player chooses from 40 different mazes, or creates a new labyrinth. Scattered throughout the maze are the digits zero through nine. The player then selects a type of math operation and its difficulty level. A problem appears and the player guides the fly through the maze to gather the digits of the correct answer (List Price: \$39.95) Requires: 64K RAM, one disk drive, PC-DOS. DesignWare, Inc. 185 Berry St., #158 San Francisco, CA 94107 (415) 546-1866 CIRCLE 757 ON READER

RXWriter

ing prescriptions. RXWriter is designed to be used by physicians in an office practice and can speed up prescription writing while creating a computer file of prescriptions which can later be searched. Prescriptions are written in duplicate, one to be signed and given to the patient, the second for the patient's clinical record. Ad- Math Maze, DesignWare, Inc.

A set of programs for writ-

vantages of the program include the ability to produce compound prescriptions easily: prescriptions are legible. drug names cannot be misspelled; Latin abbreviations are expanded and printed in English; and strings of text can be inserted anywhere within a prescription.

The program permits as many as six prescriptions to be produced on a single form. If more than one physician uses the system, a physician's name and signature line can be placed at

the bottom of prescription forms. The selected name is printed below the signature

A help routine is included in RXWriter which provides a rapid look at the information on drugs in the physician's drug file. The help function can be accessed while within the pre-

scription-writing function. RXWriter also automatically creates a disk file containing the patient's name, the date, the diagnosis (if one was entered), and the

prescription abbreviations. This file can later be searched by a utility program included with the software, which permits data retrieval by patient's name. by date, by diagnosis, or by drugs prescribed. (List Price: \$100; manual alone \$8) Requires: 128K RAM, one

disk drive. PC-DOS. Hall Design

250 Maple Ave. Wilmette, 11, 60091 CIRCLE 722 ON READER SERVICE CARD

Tax Relief I & II Two tax packages, one each for personal and profession-

al use. The professional tax package, Tax Relief II, supports 25 schedules and forms, including Form 1040 and all lettered schedules. Income averaging, minimum tax, and alternate minimum tax are calculated automatically. Calculations are carried over to all relevant places as needed, eliminating duplication of data entry. Summaries of client tax returns are provided for quick reference, and a directory is maintained containing a complete record of all prepared returns. An on-line HELP facility is provided for data entry, and input forms that correspond exactly to screen format are provided with the package.



Several options for printing



Wordlink II. Wordlink Systems Inc.

ing on blank paper in order to make use of overlays and batch printing. Tax Relief I supports 15

of the most commonly used schedules and forms. All features of Tax Relief II that are relevant for individuals are included. (List Price: Tax Relief I, \$149: Tax Relief II, \$299)

\$149; Tax Relief II, \$299)
Requires: 128K RAM, two
disk drives, PC-DOS 2.0.
Micro Vision
145 Wicks Rd.

Commack, NY 11725 (516) 499-4010

CIRCLE 724 ON READER SERVICE CARD

Wordlink II

A software-based interface for users with IBM electronic typewriters, permitting the typewriter to be used as a letter-quality printer. Designed to eliminate most of the hardware associated with typewriter interfaces, a Wordlink II-equipped typewriter can be used as a primary or backup printer. The software can produce hardcopy at up to 200 words per minute.

Wordlink II is currently available for the IBM electronic typewriters models 50, 60, 65, 75, 83, and 95. (List Price: 5-foot cable \$599; 10-foot cable \$119) Requires: 64K, one disk drive, PC-DOS, parallel port.

Wordlink Systems Inc. 1 Eva Rd., #211 Toronto, Ontario M9C 4Z5 Canada

CIRCLE 753 ON READER SERVICE CARD

The Manager Program Collection A collection of three integrated programs combining time, project, and "card

file" records management capabilities. The three programs, Task Manager, Records Manager, and Project Manager, share data and a tutorial called Dimension Aid, included with the package. Task Manager is a calen-

dar and journal system that

can help manage appoint-

ments, identify significant

dates, categorize activities,

and organize the track expenses. Tasks, schedules, and appointments are organized into 26 user-definable categories; five priority leveels help rank each activity. Keywords, categories, or priority levels can be specified to speed searches for specific historical or future events. Incomplete activities from past days can be automatically posted on the curent day. Task Manager

also offers a job expense journal with nine definable accounts to track expenses, client billing, hours worked, and income received. Project Manager aids project planning by organizing projects and available

Project Manager aids project planning by organizing projects and available resources. The program can calculate critical paths; prepare PERT, GANTT, schedule, task, or time charts; analyze resource allocations; determine slack time, and use alternative model approaches toward completion of a project. Extended detail on each project.

is also available, with as

many as 62 subdivisions.

Records Manager is a "can file" type database management system that can be used to maintain client, associate, or personnel records. It can be useradapted to meet other data keeping needs. Information is organized in four levels (called general, detailed, project and resumple againet.)

adapted to meet other data keeping needs. Information is organized in four levels (called general, detailed, project, and resume) against 26 categories, each with sorting and selection criteria defined. The project level can track planned and actual startend dates, status, and outcomes. The resume level can be used to store related information. (List Price: All three programs: \$499)

Requires: 192K RAM, two disk drives, PC-DOS. Datamension Corp. 615 Academy Dr. Northbrook, IL 60062 (312) 564-5060

CIRCLE 716 ON READER SERVICE CARD

Spellakazam

A game to teach children spelling skills, as well as improve the learner's handeye coordination. Sentences appear with a missing word. The player must correctly guess and spell the word before racing an on-screen magician to a magic hat. To enter the chosen word, the player must move quickly over rows and columns of letters arranged alphabetically.

The player wins points for correctly spelling the



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Please send me an official entry blank Please tell me the name of the nearest participating IBM PC dealer

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Distributed Logic Corporation 12800 Garden Grove Blvd. Garden Grove, CA 92643 PRODUCTS Phone: (714) 534-8950

missing word. Extra points are scored if the player can also manage to beat the magician to the top hat. Each time a player spells a word properly, an animal pops out of the hat and inserts the word in the blank portion of the sentence.

The game incorporates a 400-word dictionary, to which players can add additional words. (List Price: \$39.95) Requires: 64K RAM, one disk drive, PC-DOS. DesignWare, Inc. 185 Berry St., #58 San Francisco, CA 9407 (415) 346-1866

CIRCLE 756 ON READER SERVICE CARD

Air Trax

A real-time simulation game in which the player assumes the combined responsibilities of an air traffic controller and a Federal Aviation Administration inter-airport airlight coordinator. The assigned airspace is a 20 × 20 mile area that includes one or more airports and runways, depending on the level of difficulty achieved.

The player begins in an entry-level air traffic controller position at a low traffic-density location with well-defined light schedules. Successful performance is rewarded with salary increases, bonuses, and advancement to more demanding locations, featuring high-density traffic and variety.



Spellakazam, DesignWare, Inc.

able flight schedules. The ultimate objective is to master the world's busiest airport, Chicago's O'Hare. Features of the game include six game speeds, game hold-help, aircraft of differing sizes and characteristics, and 26 airport/traffic patterns (both fixed and random), including one the player can custom-desien.

Air Trax does not require a color/graphics adapter board to run on the user's system. (List Price: \$44.95) Requires: 48K RAM, one disk drive, PC-DOS.

Control Concepts, Inc.
P.O. Box 2367

Manassas, VA 22110

(800) 368-3078

(703) 631-0435

CIRCLE 717 ON READER
SERVICE CARD

Compu-Chef Culinary Guide

A computerized recipe file, containing a selection of approximately 90 recipes. Each recipe can be automatically adjusted for the number of servings required. In addition to the programmed recipes, the Compu-Chef Culturary Guide includes a set of appendix files. The appendices cover culturary terminology, caloric values of foods, a guide for herbs and spiees, and other categories. (List Price: \$24.95) Requires: 128K RAM, one 320K disk drive, Pc-DOS. DeAmicis Software Develop

4193 Galbar St. Oceanside, CA 92056 (619) 758-4766 CIRCLE 718 ON READER SERVICE CARD

ACCESSORIES

The Silencer
A plug-in board that climinates the audible speaker
noise generated by some
256K RAM expansion
boards. The board installs
easily in one slot within the
user's system, and does not
affect the normal operation
of the system's speaker.
(List Price: \$29)
Willon Digital, Inc.
P.O. Box 184
Melbourne, FL 32902
(305) 727-7379

CIRCLE 784 ON READER

SERVICE CARD

The Micro Saver A multiple-outlet strip incorporating surge protection and line noise filtering circuitry. The unit comes with an easily installed mounting bracket which allows it to



Mini-Printer Stand, Bretford Manufacturing Inc.

be attached to a desk table. One of the strip's four outlets has been set apart from the others, permitting the user to plug in a stepdown transformer without hampering access to the other outlets. Other features of the Micro Saver strip include a nine-foot power cord and a lighted, recessed power switch. The outlet strip is UL listed and its circuitry conforms to standards established by the Institute of Electrical and Electronic Engineers. (List Price: \$69.95) Kensington Microware 251 Park Ave. So.

CIRCLE 785 ON READER SERVICE CARD

Parallel Printer Switch

New York, NY 10010

(212) 475-5200

Parallel Printer Switch A battery-operated printer switch allowing two printers with a toggle switch. It can operate for up to one year with a single general purpose 9-volt battery. (List Price: \$75) Felloe Corn. P.O. Box 604 S. Plainfield, NJ 07080 (201) 754-5393 CIRCLE 786 ON READER SERVICE CARD MICROREF Guides A series of three printed reference guides designed to help microcomputer users learn SuperCalc (including SuperCalc ID, Multiplan, and VisiCalc. The thumb-indexed guides present the most often used software procedures step by step, and provide illustrations, a glossary of terms, an index, and a built-in support easel.

to be connected to a single

system. The switch, Model

parallel port in the user's

8310, permits the user to

select the desired printer

and experienced users, with an emphasis on speedy, time-saving instruction methods. (List Price: \$14.95) Educational Systems, Inc. 1000 Skobe Blvd. Wilmette, IL. 60091 (312) 256-4750 CIRCLE 787 ON READER SERVICE CARD.

Computer-Plus Care Kit

The MICROREF guides

are designed for both new

A computer cleaning kit consisting of an anti-static treatment, an anti-static cleaner, and reusable cleaning swabs. CLEAR I, an antistatic treatment, and CLEAR 2, a cleaning solution, each come in 8 ounce spray bottles. Both can be used directly on work surfaces, display screens, and peripherals, as well as on work surfaces and the rest of the data processing area. They are nonflammable, nontoxic, and safe for use on any material that will not

nontoxic, and sare for use on any material that will no water-spot. (List Price: \$29.95) White's Computer Supplies 3348 Niles Rd. St. Joseph, MI 49085 (616) 429-2545 GIRCLE 789 ON READER SERVICE CARD

PIXTIK A real-time clock which is fitted to the PC externally, eliminating the need for an add-on board. The clock is plugged into the parallel printer port, and the user's printer is plugged into the clock module. The PIXTIK clock does not affect operations of the printer.

The unit has an integral Ni-Cad rechargeable cell which provides date and time retention while the computer is not powered

up, for up to 2 years, Software is provided for automatic updating of the internal PC-DOS clock at system start-up time, to ensure that the date and time are always correct. The clock uses a 24-hour time format, has full date facilities including leap year correction, and also provides automatic summer time-adjustment corrections. (List Price: \$49.99) PIXEL-PLUS Ltd. 31 Rarton Lane Nailstone, N. Nuneaton, Warks, GB CV13 OPY 0530-62565

CIRCLE 788 ON READER SERVICE CARD

Mini-Printer Stand
A stand for elevating an 80column printer, available in
two models. The WSPS-1
model will elevate a printer
with a 9½-inch paper feed
and can accommodate a
continuous flow of paper.
The WSPS-2 stand elevates
alternational standard and accommodate a
continuous flow of paper.

The WSPS-2 stand elevates a larger printer with a 15inch paper capability. Each unit has a slot accommodating the appropriate bottom

ACCESSORIES/PUBLICATIONS

feed printer.

The printer stands are constructed of solid steel and are finished in putty beige enamel. (List Price: WSPI \$32: WSP2 \$43) Bretford Manufacturing Inc. 9715 Soreng Ave. Schiller Pk., IL 60176 (312) 678-2545 CIRCLE 793 ON READER

Executive Computer

Desk A desk designed to house all of a user's PC components. Within the single cabinet, it has sufficient capacity for the systems unit. monitor, keyboard, printer, plotter, modem, expansion chassis, paper, and software documentation. The Executive Computer Desk is available in oak or walnut. (List Price: \$662 oak, \$729) walnut)

Packer Woodworking 10 Brook Trail Rd. Concord, MA 01742 (617) 491-5200

CIRCLE 791 ON READER SERVICE CARD

ERGO-TECH

An ergonomic workstation with a full range of adjustments, designed to reduce operator fatigue by reducing eye and back strain and positioning the body in a comfortable posture

The overall height of the unit is 31 inches. The keyboard surface adjusts from

heights of 26 to 28 inches, and the monitor surface adjusts from 30 to 32 inches. Both surfaces tilt and adjust either toward or away from the operator. (List Price: \$295) James Systems Division 2929 N. Oakley Ave. Chicago, IL 60618 (312) 472-2611 CIRCLE 790 ON READER

EC-15 Computer

Table A steel table with an adjustable too shelf and work surface, designed to accommo-

EC-15 Computer Table, Bretford Manufacturing Inc.

date a variety of microcomputer systems. The table incorporates a power strip with a single neon-lighted switch, located on the front of the work surface, which can turn the entire system on and off.

The 15-ampere switch and its connectors are housed in a protective channel under the work surface, with a grounded outlet at the rear of the channel. The table has 1-inch square tubular steel legs on 4-inch casters, two with locking brakes. It is finished in putty beige enamel.

(List Price: \$280) Bretford Manufacturing Inc. 9715 Soreng Ave. Schiller Park, IL 60176 (312) 678-2545

CIRCLE 792 ON READER SERVICE CARD

PUBLICATIONS

Software Digest Ratines Newsletter A newsletter designed to help readers find the best and easiest-to-use applications programs. The programs, divided into categories, are evaluated by 10 individual users whose ratings are averaged. (List Price: \$90 for six

issues) Software Digest, Inc. 1 Wynnewood Rd. Wynnewood, PA 19096 (215) 649-7000 CIRCLE 796 ON READER SERVICE CARD

Kelly-Grimes Buyers Guide

A product directory designed to serve as an initial reference to computer systems, software, peripherals, accessories, and supplies. The guide explains computer features and terminology in a nontechnical manner. providing information both for buying a new system and for expanding existing systems. A glossary, a software index, and product comparison charts are included





The first IBM" competible that IS competible! A complete system including the PC-DOS™ operating system from IBM™. Two thinline doublesided 5%" Disk Drives hold 360K of formatted storage each, the other drive opening is fitted with a close-out plate. Removal of the plate will allow room for a Winchester Hard Disk. The Power Supply is like that of an IBM-PC XTM...Hard Disk ready! How competible is the XPC-XT? It will run 1-2-3" Flight Simulator", dBASE II", WordStar", SuperCalc", VisiCalc[®] and hundreds of others, The system will also support MS-DOS™ 1.1 and 2.1, PC-DOS™ 2.2, CP/M-66™ and Unix Operating Systems. Add-on an additional 192K of RAM for a full 256K of on-board Memory for only \$195.00. This computer comes standard with 2 Seria and 1 parallel ports (IBM™ COM1 and COM2). No need to purchase Add-On cards

Standard Features:

PC-DOS" Operating System Vers. 2.1 •110-220 VAC. 50-60 Hz •64K of parity checked RAM, expandable on-board to 256k •8088 16-bit CPU

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 Up to 32K of EPROM (supplied with full 8K) *DOS 8IOS on EPROM ·Full size capacitance touch keyboard with

10 function keys and calculator type

numeric keypad

•High resolution, 12" Monitor with Green creen and 18MHz bandwidth. •Two Slimline 5 % " DS/00 48 TPI Floppys @ 360K storage each *Floppy Clisk Controller e runs up to four SS or DD Floppys *ALSO supports MS-DOS" and

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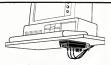
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f you walk into any data processing department in America, you'll see rows of programmers sitting idly at terminals waiting for their compiles, links, and test runs to finish. Is this any way to earn a living? Seventy-five percent of programming consists of nursing mundane jobs through the system in order to discover the next round of bugs. Spending hours of your time hitting the Enter key just because the computer goes beep can lead to premature burn-out. In fact, many of these tedious steps could as easily be performed by a robot-or a computer program. Programming has evolved just such a solution.

In the early 1970s, about the time that Conversational Remote Job Entry (CRJE, pronounced kridgie) was liberating programmers from airless keypunch rooms, some of the larger minds at IBM began looking at the problem of terminal fatigue. If jobs submitted on cards could call up a number of programs in sequence using OS Job Control Language, why couldn't a programmer sitting at a terminal invoke a whole series of commands with a single supercommand? So they invented a new kind of file called a command list or CLIST, which turned out to be nothing more than a list of commands, one ner line. If the file was named LIST1, then LIST1 became a new supercommand whose function was simply to issue the commands it contained.

CLISTs have now begun to take on more functions. The addition of parameter passing, conditional command execution. branching, subroutines, and external command list invocation have made CLISTs now look more like programs than data files-and, as a matter of fact, that's exactly what they are. The CLIST Language, Job Control Language, and VM/ CMS EXEC Language, are all examples of interpreted command languages that partially automate the role performed by the programmer.

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LANGUAGES

with DOS, but for most of us this throwback to CRJE was nothing to get worked up about. DOS 2.0 enticed us with such functions as branching (GOTO), conditional execution (IF), and an offensively illogical kind of variable manipulation called SHIFT, but for old-timers, DOS 2.0 teases but doesn't deliver. Finally someone has solved the problem, and it's neither IBM nor Microsoft. A new "freeware" package called Extended Batch Language (EBL), written by Frank Canova and distributed by Seaware Corporation, implements a command list facility so powerful that you can create multilevel menu drivers with it and even write simple games. Best of all, it can actually read the screen and "type" on the keyboard (i.e., place data in the keyboard stack). Aside from eating Szechuan food, real program-

mers could hardly do more.

EBL (version 2.0) statements are imbedded in standard DOS batch files and look suspiciously like CMS EXEC statements. Figure 1 is an example of a batch

file written in EBL.

The word bar, with which most EBL statements begin, is the hook into the systems ince BAT COM is the file in which all the code is kept. Once the first BAT all the code is kept. Once the first BAT command takes off, it initializes its resident portion and then reads and execute the rest of the EBL statements and DOS commands in the file. Subsequent EBL statements must also begin with the word bat to distinguish them from DOS commands, but because they don't need to reread the BAT.COM file, EBL is relatively fast. Let's look at each line.

The first line in Figure 1 is just a comment to the effect that this .BAT file will look for a CHESS.BAT file and, if found, will offer to play chess. If accepted, it will then pass control to CHESS.BAT. You Extended Batch Language

CIRCLE 705 ON READER SERVICE CARD

Seaware Corporation P.O. Box 1656 Delray Beach, FL 33444 List Price: \$30.00 might include logic like this as part of your AUTOEXEC processing to simplify booting. Just insert the chess diskette in the B drive, fire up the machine, and the computer will seem to anticipate what you have in mind.

Line 2 checks for the existence of the CHESS.BAT file on any drive (but only the current path if you're using DOS.2.x) and sets the variable %r to reflect the result as follows:

0 File found on default drive

1 File not found 9 Illegal filespec

<. and < >

Cleverly enough, if %r is none of these, then it will be set to the drive letter (a through d) the file was found on. The STATEOF command supports filespee wildcards, too. If the file is not found, line 3 instructs the program to leave the. BAT file. Other relational operators include >-

If the file is found, but not on the default drive, line 4 instructs the program to save the letter of the drive it was found on (concatenated with a colon) in the variable %d. Also, since variable names can only be one character in length, string concatenation is a simple matter of pressing the strings together.

Line 5 prints a message on the screen. The hexadecimal numbers following the backslashes provide screen attribute information—in this case, highlighting the word CHESS—while the semicolon suppresses a line feed so the cursor will stay near the question mark.

near the question mark.

Mainframes don't provide characterby-character interaction with terminals, so
users of time-shared CLBTs and ONE
ENEC's must hit the Enter key to register
their response. EUR'S INNEX' function is
patterned after Microsoft BASIC, which
such savinargo of the fact that you have
states sthousage of the fact that you have
key pressed on the keyboard will be
key pressed on the keyboard will be
sasjaged to the 'Ke variable. (The program
can sense special keys by comparing them
to special literals with a format of
KEYACK, where XXX might be 01b for the
Eke key, for example, or 147 for the Home

key.) Note the use of the command concatenation symbol "1" to group related commands (line 6 in Figure 1). This is useful in IF processing since all concatenated commands are executed on the same condition. The TYPE command reflects the user's response back to the screen.

The Keyboard Stack

```
lowed later by a STACK.ON.
```

EBL surpasses anything mainframers have in its ability to "read the screen." The READSCRN function reads the words from the previous line into variables that you name. Each successive READSCRN reads up the screen and also sets %r to the number of the line you've just read so you don't accidentally go The final statement in Figure 1 checks | beyond line 1. Thus you could read mes-

```
batch file that refers to them by name.
  Besides the %r system variable (which
can be set by any program by modifying
the byte at 0:4FE), you also get:
```

"S" if there are lines in the stack; otherwise "K" (for keyboard)

The current default drive (a sin-%v gle letter). A single space, used to embed %s

blanks in variables. %% A single percent sign.

Special Assignments

Assignment statements come in several flavors, too. Aside from the garden variety illustrated above, you can perform nullification ("%a = "), and simple arithmetic using the standard +, -, / and * operators (as in "%a = %b + %c"). As if that weren't enough, you can also do length detection ("%a = %b #" means "Assign to %a the length of %b") and substring extraction ("%a = %b \$ 1 3" means "Assign to %a the first three characters of %b"). These last formats become essential for advanced applications.

For a small charge. Seaware lets software developers include EBL batch files with their packages. So besides delighting legions of burnt-out programmers, it should alleviate the suffering of new users who, when they open a new \$900 copy of brand-X software, are faced with 3 days of one-time setup procedures.

Extended Batch Language should be in the libraries of most computer clubs and dial-up services soon, but if you can't find it, send \$30.00 to Seaware Corporation for a diskette containing the latest program version, on-line demo and a tutorial batch files, useful utilities, and a 70-page manual with descriptions, examples, and tips, There is also a bulletin board service where you can share the merry musings of a large community of EBL users.

Dean Hannotte is a microcomputer consultant, an amateur violinist, and a bibliophile with a special interest in children's books on dinosaurs.

bat * Offer to play CHESS with the human... bat stateof chess bat

bat if %r = 1 exit

bat if %r <> 0 %d = %r:

bat type How about a nice game of \OfCHESS?\07; bat inkey %k | type %k

bat if %k = y stack %dchess | stack n | stack 24

Figure 1: An example of a batch file written in EBL.

the user's response. If y is pressed, three lines will be placed in the "keýboard stack." The keyboard stack refers to an area in storage where responses to upcoming reads to the terminal are stored before they are requested. If %d is to set to b:, for example, the three lines stacked when %k = v will be:

h:chess 24

These three lines are available to any program that reads from the terminal, including DOS itself when it's looking for the next command. Thus, when the current batch file is finished and DOS wants more work, it will find "b:chess" when it issues a read to the terminal and will proceed to execute the B:CHESS batch file. The next two stacked lines are hypothetical responses to questions from the chess program. The ability to use EBL to answer questions you know a program is going to ask makes program initialization and parameter setting much less tedious. You can also erase the stack with a STACK PURGE command or merely desages from a compiler, for example, and go on to the LINK command only if the last message was 0 ERRORS FOUND! Other functions of FRI include:

BEEP Sound the alarm CALL Call a section of the batch file. which subsequently initiates a

RETURN. CLS Clear the screen

GOTO Unconditional branch. Labels begin with hyphens and can be 15 characters long, such as -LINK.THE.PROG

READ Read an entire line from the keyboard (which benefits from the availability of all the editing keys) and set zero or more variables. Optionally, use TYPE to type a message first (you can do this with INKEY too)

Variables are divided into DOS variables (%0 thru %9, which can be set as well as read) and "global user variables" (%a thru %o). Any variable can be up to 15 characters long. User variables are called global because they retain their values after the batch file has exited and can fer it with a STACK.OFF command fol- therefore be examined by any subsequent

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User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.



BASIC Errors

An undocumented feature of the direct mode of MS-BASIC saves looking up the meaning of the 73 error codes (76 in version 2.0) in the BASIC manual.

When using the BASIC editor, entering the command ERROR, followed by the error code of interest, prints the corresponding error message, for example:

ERROR 26

FOR Without NEXT

BASIC 2.0 adds three additional error codes. Since the 2.0 instruction manual uperade must be ordered by mail from IBM, this method can be used to investigate the new codes until the manual arrives. Codes 74, 75, and 76 are related to the structured disk directory functions that IBM added starting with PC-DOS 2.0, and the path names required to completely designate a file.

They are:

ERROR 74 Rename Across Disk ERROR 75

Path/File Access Error ERROR 76 Path Not Found

> Dick Gall Richardson, Texas

Keep those undocumented discoveries comin' in.

Updates Made Easy

PC users often use the COPY A: *.* B: command to copy all files on drive A to drive B. Unfortunately, DOS lacks a command that would copy only files on drive . A that already exist on drive B. The batch file UPDATE.BAT in Figure 1 will do it.

Note that the UPDATE.BAT file assumes that the backup disk is in drive B and the working disk is in drive A. I also use this method for backing up parts of a fixed disk's directory.

> Mark Templer Tempe, Arizona

You can create a version of this file that will let you choose which disks to copy from and to (see Figure 2). Type everything except the A> prompt and the

instructions inside the brackets. If you want to copy all the files already on drive A from drive C to drive A, you would get into DOS and type:

UPDATE C A

then hit the Enter key. Note that you omit the colons after the drive names; the batch file puts them in for you. Be careful to type all the colons, percent signs (%), and double percent signs exactly as indicated, or you'll end up with a fine mess.

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REM This program copies files selectively from REM drive A: to drive B:. Only files already stored on drive B: will be copied from A: REK DEM to B:. If you want to interrupt this program REM type Ctrl-Break PAUSE B:

FOR XXF IN (*. *) DO COPY A:XXF B:XXF A:

Figure 1: Batch file to conv files that exist on two disks.

	PY	CON	UPDAT	E1. I	BAT						ENTER	
X2:								[then	hit	the	ENTER	key)
FOR	XXF	IN	(*. *)	DO	COPY	X1:XXF	12:11F	[then	hit	the	ENTER	key)
X1:								[then	hit	the	ENTER	key.
								then	hit	the	F6 key	
								then	hit	the	ENTER	key1

Figure 2: Improved batch file to copy files that exist on two disks.

Hard Disk Disaster

Owners of the IRM-PC/XT can suffer from a severe case known as the HDDDD "Hard Disk Data Destroyed Disaster", if they are not careful when using the FOR-MAT command. If you boot from the hard disk (which then makes the C drive the default) and type FORMAT in preparation to format a floppy disk. DOS will assume you want to format the hard disk instead. and will reformat it (thereby erasing all your files) without any feelings of guilt.

The change in the FORMAT command in Figures 3 and 4 will force users to include a disk drive designation when using the command.

Another note of interest-IBM has just instructed all its dealers to distribute (for free) the DOS 2.1 version of POR-MAT.COM. It has been rewritten to close up some "potential" problems. Wesley Merchant

Vice-President Capital-PC Club Annandale, Virginia

It's about time. Many thanks from all us hard-disk users.

Format Snooping

It is often useful to be able to determine in what format a BASIC program was saved. This can be done by checking the first byte | FORMAT.COM. See Figure 3.

of the file. For protected files (saved with the "P" option), the first byte is ASCII 254. Standard tokenized files are marked with ASCII 255 in the first byte. ASCII files are not marked at all. We can treat any file as a sequential file, read in its first

C>DEBUG FORMAT. COM -A 17B xxxx:017B JMP 160 xxxx:017D NOP xxxx:017E xxxx:017F

Writing 1780 bytes

Figure 3: DOS 2.0 instructions for fixing FORMAT.COM. Type everything underlined and Ctrl-Break before the W.

C>DEBUG FO	RMAT.	COH
-A 191		
xxxx:0191	JMP	16B
xxxx:0193	NOP	
xxxx:0194	NOP	
xxxx:0195	NOP	
- <u>W</u>		

Writing 1B00 bytes

Figure 4: DOS 2.1 instructions for fixing

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USER-TO-USER

record, and test the first byte. The program in Figure 5 will do this job.

You can use DEBUG to see the marker in the flesh. Write a simple BASIC program line such as: 10 ABCDE. Now save it three times, first as A.BAS, A in ASCII format, second as P.BAS, P in protected format, then as T.BAS with a plain save command. Go to DOS and type in DEBUG A.BAS, then D 100, and you will see the following: 31 30 20 41 42 43 44 45, and some junk that doesn't interest us. This is the ASCII translation of the program, character by character, in hexadecimal notation. Type Q to quit DEBUG and then type in DEBUG T.BAS, and then D 100. The first byte is FF (decimal 255). The following two bytes hold the address where the next program line could begin, and the program follows: 0A is the line number, 00 is the space, and the program itself is 41 42 43 44 45. Quitting again and doing the same routine for P.BAS will show data that makes no sense, except that the first byte is FE as

promised.

Harold Brown DeKalb, Illinois

While it's faster and easier to use DEBUG for this, the program is instructive.

Printer Test Redux

There seems to be a problem with the Printer Test in the Volume 3 Number 3 "User-to-User." If you check the IBM Technical Reference manual (August 1981 printing) you will note that on page 2-68 the address given for the "IBM Monochrome Display & Printer Adapter" is 3BDh, which corresponds to 957 decimal, as used in the test.

is 3BDh, which corresponds to 957 decimal, as used in the test. However, on the same line of the chart, the address for the "Parallel Printer Adapter" is given as 379h, which corresponds to decimal 889, INP(889) gives the

appropriate results on our machine, while INP(957) does not. Incidentally, if you glance at page 2-67, you will find corresponding addresses

```
' BASIC progree formet checker -- by Harold Hrown (edepted by PC)
130 IMPUT "Enter the name of the file you went checked: ", FLMMe
           -- contrates fileness and check for extension --
150
160 '
ACV TOM ACA 10 ACMIFLEMEN 110 CHEW (46) THEN FLAG-1
190 IF ASC(MIDE(FLHME, A, 1)) < 97 ON ASC(MIDE(FLHME, A, 1)) > 122 THEN 210
200 MIDE(FLHME, A, 1) CHEWAGAGINE (EDBEFLHME, A, 1)) AND 95)
           -- oheck for extension end edd . HAS if necessary --
     IF FLAG THEN 300
IF RIGHTO(FLAMO, 4) <> *. NAS* THEN EXTO**, BAS*
          -- onen file and evening first byte --
300 OPEN PLNNG-EXTS FOR INPUT AS #1
220 4-490(14)
330 PHIRT "The file "; CHRs(34); FLNHs; EXTs; CHRs(34); " is seved in ";
340 IF A-254 THEM 370
350 IF A-255 THEM 380
360 PHINT "ASCII forest. ": GOTO 390
350 PHIRT "ASCII formet. "160TD 390
370 PHIRT "protected formet.":60TD 390
380 PHIRT "tokenized formet."
390 CLOSE #1:END
          -- file not found --
430 IF EMM-53 THEM PRIRT "Sorry, thet file is not on your disk"
440 NESUNE 130
```

Figure 5: Program to examine format of BASIC files.

P.O. BOX 41628

```
10 FOR I=0 to 1024: IF INP(I) = 223 THEN PRINT I:
26 NEXT
```

Figure 6: A short test program for your printer.

```
100 ' Dynamic Printer Statue Line Dieplay -- by John P. Bedell
110
120 OIN BIT(8)
130 FOR I=0 TO 7:BIT(I+1)=2*(7-I):MEXT I
140 CLS
150 PRINT *PRINTER STATUS FROM PORT 957 =
                                                 (DECIMAL)*
160 PRINT
170 PRINT "BUSY------
180 PRINT "ACKNOWLEDGE--->"
190 PRINT "OUT OF PAPER-->"
200 PRINT "SELECTED---->"
210 PRINT "OUTPUT ERROR-->"
220 PRINT *NOT USEO----->*
230 PRINT *NOT USEO----->*
240 PRINT "TINE OUT----->"
250 RAWSTATUS - INP(957)
270 '
       -- INVERT LINES : -BUSY, -ACKNOWLEDGE, AND - ERROR.
290 STATUS - RAWSTATUS XOR 200
       -- EXAMINE EACH BIT AND PRINT HIGH/LOW ACCORDINGLY
310 '
220 '
330 FOR I - 1 TO 8
340 LOCATE 2+1,17
350 IF (STATUS AND BIT(I)) -> 0 THEM PRINT "NIGH" ELSE PRINT "LOW "
360 NEXT I
370 LOCATE 1, 31 PRINT RAWSTATUS
380
      -- WAIT FOR A CHANGE IN THE RAWSTATUS
290 4
400
410 IF RAWSTATUS . INP(957) GOTO 410
420 GOTO 250
430 RIIN
```

Figure 7: A program to display printer status dynamically.

of 3BEh and 37Ah, respectively. 37Ah is decimal 893. INP(893) also returns 223 only when the printer is on line and ready to go on my PC. It is possible that serial printers might

give different results. Readers could check what worked on their installation by running the short test program in Figure 6 with the printer on-line, ready to go Now turn the printer off-line and check

INP (of the numbers you got in response to your program). It may well turn out that all installations could be covered by some OR combina-

it on the printers in the office and it

tion of the codes Ada Booth You're right. The problem is that we tested

Santa Clara, California

who spotted this problem. For an interesting look at how this works, see the letter below from John Bedell.

large enough variety of machines. Thanks

also to Joan Young, and Russel C. Moe.

Dynamic Printer Test

The program in Figure 7 dynamically displays the printer's status bits as either high or low. You can then check the lines in the cable by placing the printer on/off line and removing/adding paper. If a particular status line does not change, look up the pin number in the reference manual and examine both ends for a broken wire.

> John P. Bedell Royal Oak, Michigan

This display technique is very clear-can anyone out there adapt it to any other staworked; but we obviously didn't try a tus checks?

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Multiplication Problems

Q: I work for a company that makes printed circuit boards. A few months ago we bought an IBM XT, which was just what



we needed. Since then, I have written the software for the company's computer. Now we find that we need a multiuser system. We want to add several more terminals (two to seven) that would access the XT.

Although I've heard that such systems are available for the IBM PC. I have yet to locate any that suit our needs. Also, since my knowledge of hardware is limited, a solution that would require me to witre up some fancy interfaces probably wouldn't work. Can you recommend any systems that might be of use to us? We don't need anything fancy.

Gregory Fedor Bedford Heights, Ohio

A: I'd need substantially more information to come up with a solution for your specific situation. What I can do here is suggest a few approaches that might work for you or help other users.

The setup you want might require a multitasking or multiuser operating environment, so I'll explain what these two things are. A multitasking operating system lets more than one program run at the same time. It might also allow the simultaneous programs to access a common set of files. In most multitasking systems, only one program at a time can write to a specific (Although PC-DOS 2.0 is not a multitasking operating system, version 3.0 probably will be.

Digital Research's Concurrent CPIM-B6 is one multitasking operating system that's now available. It can handle up to four programs running simultaneously, which could include a spreadsheet, word processor, and database manager. Since you could combine various commercial programs with those you create, the Concurrent CPIM-B6 approach might be useful to your comment.

A militisser operating system will let more than one person at a time ran programs on the same computer. By nature, a multiuser system is a multiusking one, too, since the simultaneous users would be running different programs or doing different things with the same program. Most mainframe computers today are multiuser systems.

AT&T's UNIX is a multiuser operating system, and so is XENIX, Microsoff's version of UNIX. Another multiuser multi-tasking operating system for the IBM PC, based on UNIX System III, is VENIX from VentureCom, Inc. (215 First Street, Cambridge, MA 02142). Note that PC/IX, IBM's release of UNIX for the PC, is multitaskine but not multiuser.

You say you don't need anything fancy. If your definition of "fancy" is "a system using anything but PC-DOS and BASIC," you may be closing off some of these viable options.

Since PC-DOS 2.0 isn't even multitasking for a single user, none of the multiterminal programs that run under PC-DOS are systems that can handle more

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than one user accessing one file at a time. Also, if your program is written in IBM's BASIC, and uses any of the PC's special graphics and screen-handling functions. then any attempt to run these programs on a multi-user system is doomed to defeat.

If your BASIC programs do not use these special features, you might be able to make them run after switching to one of the operating systems that can handle simultaneous users. The solution is easier if your programs are written in the C lanquage.

If your own applications programs are simple enough, you might be able to adapt them to support additional terminals. Routines to do this could poll each terminal's serial port (i.e., read them one at a time). When the polling process finds activity at a port, the program can process the characters entered at that terminal. If there's no activity, the program goes on to check the next terminal's port. This method could be feasible, provided your pro-

The PC is ill-suited to a multiuser environment Its processor is probably not fast enough to support simultaneous users.

gram won't be asked to work too hard for too many users at once. In any case, there are two problems

with having a multiuser program running on a system with several terminals attached to a PC. First, the program can't take advantage of the PC's display capabilities because the terminals do not share the PC's display memory. Second. the keyboards on most terminals differ from the PC's, so programs that expect a user to press specific keys (such as the PC's function keys), will not work at the terminals.

I believe the present IBM PC is illsuited to a multiuser environment. Unless all your applications involve a lot of "think time," so only one person at a time is actually using the processor, the PC's 8088 processor is probably not fast enough to support a number of simultaneous users. Running a system with seven users (the upper limit in your proposal) is completely out of the question. If your company needs a setup of that magnitude, you might be better off purchasing a faster computer that is equipped with a multiuser operating system.

Batch Files in the SHELL

O: I can't seem to get BASICA to execute batch files. When I try using the command RUN "BATCHFIL" there's an error message indicating "File Not Found." I don't care if my BASIC program is crased when the batch file runs, because I plan to have the last command in the batch file invoke the BASIC program again.

Larry Steinbacher LaSalle, Colorado

A: With PC-DOS 2.0 you can execute a batch file-or run any other programwhile running BASICA by making use of the SHELL command within your BASIC program. Here's a sample program that includes the SHELL command:

10 SHELL "DIR A:" 20 CLS

30 PRINT "This is a test"

The first line of this BASIC program will execute a DIR command from PC-DOS to print a directory of drive A. The second and third lines then use standard BASIC commands to clear the screen and display a line of text.

In line 10, if you replaced "DIR A:" with the name of your batch program (surrounded by auotation marks), that program will be run from within BASIC. Note that your batch file should not have a line

BULL????

A lor of it is being thing around? Charly, you need a lor more than just an index finger and in efficie to meaningfully use a caster? After the first blash of movely and gianticky use of nested and of the caster of the first blash of movely and gianticky use of professional control of the caster of the caster



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that will rerun BASICA. This would cause two copies of the language interpreter to be loaded into memory, causing a significant waste of RAM.

When your task is ready to return to BASIC, simply write lines in your BASIC

With PC-DOS 2.0 vou can execute a batch file while running

BASICA by making use of the SHELL command within vour BASIC

program.

program that will be executed following the SHELL command, such as lines 20 and 30 above

Oddly enough, the manual for BASIC 2.0 makes no mention of the SHELL command in either its index or its alphabetical list of commands. (See "Treasures Buried in BASIC" in PC, Volume 3 Number 5, page 60.) What the SHELL command does is to load the PC-DOS command interpreter program (COMMAND.COM) and have it execute the commands named in the argument (surrounded by quotes) that follows the word SHELL. The results are similar to those you'd get if you responded to a PC-DOS prompt (such as A>) by typing in the commands that follow SHFII.

If you use BASICA with PC-DOS 1.1. then there's no SHELL command for you to call on. In that case, unfortunately, there's no way to run a batch program from within BASIC. What you can do instead is to write the BASICA program calls as part of a longer batch program that's started from PC-DOS. That way you can break your BASIC program into portions, each of which concludes and returns you to PC-DOS at appropriate spots.

This batch program, for example: BASTCA "PROG1"

DTR A: BASICA "PROG2"

will run the first portion of your BASIC program (named PROG1 here), then perform DIR A: (or any number of PC-DOS commands), and finally load and run the second part of your BASIC program (PROG2).

If you are clever enough to manage it. you can have your BASIC programs alter the batch file as they run. You must be sure, however, to avoid changing any text in the batch file that comes before the call to BASICA.

Switching to 80 Columns

O: When I boot up my PC with PC-DOS 2.0, the screen starts out displaying 40 columns. I know I can change it to 80-column and color operation by keying in the MODE CO8O command.

Can I get the computer to start out with an 80-column color screen, no matter what disk I use to boot up? Surely I don't have to write an AUTOEXEC program to do that

> B. F. Cell Edinburg, Texas

A: Your problem is simply that some of the switches are set incorrectly on the system board of your PC. To change the display setting to 80 columns and to color, find Switch I and set its position 5 to on and its position 6 to off. For specific diagrams and more information, see pages 5-13 and 5-15 in IBM's Guide to Operations.

The PC Tutor solves practical problems and explains points of general interest to users of the IBM Personal Computer. If you'd like to see your questions answered in this column, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

Can We Talk? A Modem Primer

Are you ready to venture into the swamp of communications jargon? If you think you are, read on and you will learn much more about modems than the average PC user knows.



modern is a device that lets a computer talk over the phone lines. Unfortunately, that's about the extent of most PC users' knowledge of moderns, with good reason. Beyond this simple level of understanding, it's easy to get lost in a swamp of communications jargon: duplex, echoplex, build rates, protocols, direct connect versus acoustically coupled, and on and on.

If you're a bit confused about communications, but you're willing to venture into the swamp, read on. I'll tell you all about moderns: what they are, what they do, and the differences between one species and another.

To begin with, modems have more to

puters so it helps to know a little communications jargon, particularly the terms baud rate, duplex, and echoplex.

Bound rate is a measure of speed. The rule of thumb for converting band rate into characters per second is to divide by 10—300 band translates to 300 characters per second, and 1200 band translates to 120 characters per second. Technical purists will quibble with this conversion, but it works. Nonetheless, remember that it is only a rule of thumb.

Duplex means two-way communications and is broken down into half-duplex and full-duplex. In half-duplex communications, each side of a conversation must wait until the other is finished, which is similar to the way a CB radio works. In full-duplex communications, either side can transmit at any time, which is similar to the way a telephone works.

Most modems contain either a mechanical or electronic switch that is labeled full-duplex/half-duplex. This switch is the cause of a great deal of confusion about moderns, because it a traulily has nothing to do with the duplex setting. If your moderns as such a switch, you are always engaged in a full-duplex conversation no matter how it see. The problem is simply that the switch is mislabeled, it should be called echoplex/nonechoplex.

When you're communicating by computer, it is often helpful to have some way to double-check that the person at the other end receives correct information. Telephone lines can be noisy, and the noise can garble the information you're sending, One of the simplest methods for doublechecking the information is echoplex, in which the receiving side echoes each letter you send. When you type a letter on your keyboard, it travels out your modem and over the phone lines, is received by the system on the other end, is echoed back to you, and finally shows up on your screen. If the letter on your screen is the same one you typed, you can be reasonably sure that

it was received correctly at the other end. Most systems take advantage of echo-

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plex, but if the system you're talking to is not using it, you'll want your own system to put a character on your screen. Otherwise you'll wait for an echo that will never come. Most modems give you a way to switch between distant echo (from the other system) and local echo (from your own modem), although they don't usually call it that. By some perversion of logic, the industry has managed to draw an equation here and has wound up calling local echo half-duplex and distant echo full-duplex. This is certainly confusing, but the mistake is nearly universal, and we're stuck with it.

Standard Protocols

What really determines the duplex nature of your conversation is the protocol that your modern is using. Each protocol is a different scheme for sending and receiving information. In a sense, the difference between one protocol and another is like the difference between AM and FM radio. You don't have to know much about the protocols themselves, but you do have to make sure that the protocol on your end matches the protocol on the other. There are over a dozen different communications protocols for modems, but only two are of any real importance to most PC users.

The first and by far the most common protocol is Bell 103, a full-duplex protocol that functions reliably over standard phone lines at speeds up to about 600 baud. All but a few 103-compatible modems, however, have a maximum rate of 300 baud. Some 103-compatible modems are limited to 300 baud only, which is by far the most common speed used with this protocol. Other modems are limited to 110 and 300 haud, the two most common speeds, and still others can function at any of the standard speeds between 0 and 300 baud.

There is also a Bell 113 protocol, which is completely compatible with the 103 protocol. As a result, you will sometimes see references to the "103/113 protocol" or the "100 series protocol"; they mean the same thing.

A protocol that is rapidly gaining in

popularity is the Bell 212A, which is also full-duplex. Unlike the 103, though, the 212A protocol is capable of reliable 1200haud transmission over standard phone lines. 212-compatible modems are more expensive than 103-compatible ones, but they let you spend over 75 percent less time on the phone. The savings in phone bills alone can easily pay for the difference in the price.

A direct connect modem is plugged directly into a part of the phone system.

Most large on-line systems, including CompuServe, Dow Jones News/Retrieval, NewsNet, and The Source, can communicate with either a 103-compatible or 212-compatible modern. Some small bulletin board systems can also communicate with either protocol; others are limited to 103-compatibility.

Meet the Modems

This discussion brings us to the modems themselves. An individual modern may or may not have some options, but

most fall into one of four groupings. · 103-compatible, acoustically coupled, standalone modern. If there is such a thing as the archetypal modem, this is it.

Standalone means that the modern sits outside your PC and is connected to it through a cable to your RS-232 serial port. The RS-232 port is an industry-wide standard that lets two pieces of equipment talk to each other. You'll find the port on your PC's communications card.

Acoustically coupled means that this type of modem uses the telephone the same way you do. It sends information by speaking into the phone handset and receives information by listening to the other end of the handset. Acoustic modems have two rubber cups (one for each end of the handset) to hold it in place and



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to help muffle any noise in the room. Any noise the modem picks up will usually be translated to garbage characters in transmission. To use an acoustically counled modem you simply make a call to another computer and then put the handset in the rubber cups. Typical acoustic moderns cost between \$100 and \$200.

 103-compatible. direct-connect. standalone modern. The basic difference between this kind of modern and the first is in the way it connects to the phone lines. A direct connect modem is plugged directly into a part of the phone system, usually the wall module. You can then plug in a phone along with it, using a Y connector, In some cases you can plug the phone directly into the modern instead.

Some direct-connect modems are capable of auto-dialing; you can dial either directly from your keyboard or through your software by storing the number in a phone directory. Direct connect modems can include a wide range of additional options besides auto-dialing. Depending on the options, these modems range in price from under \$100 to about \$300.

• 103/212-compatible, direct-connect, standalone modem. The only difference between this category and the last is the additional ability to communicate at 1200 haud with 212 protocol. This capability carries with it an increase in price; 103/ 212-compatible direct-connect moderns start at about \$450.

 103/212-compatible, direct-connect, modems-on-a-board. Once again, this variety adds only one new wrinkle. The modem-on-a-board slips into a slot in your IBM PC so you don't need a communications card or a cable to connect the modem to the computer. These modems also tend to be cheaper than their standalone cousins; they start at about \$500 but are equivalent in capabilities to standalone modems costing \$600 or \$700. In addition, they usually include software as a bonus.

This list doesn't include every modern but it does cover the most common varieties. In future issues I'll look at some specific modems in each category.

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The PC Portable

The IBM Portable PC has made its debut and is bound to have a profound effect on the portable computer market. We'll venture into that marketplace to explore who will buy the machine, why it was introduced now, and what went into its construction and marketing. We'll also test the PC portable's compatability with other IBM products and see how it stacks up against its predecessors.

PCs in the White House

Forty PCs are scheduled to enter the White House as part of EOPNET, the new executive office of the president network. We'll take a look at this state-of-theart system that is automating the office of the president.

Simulating Flight

The intrepid Paul Somerson will attempt to use the Microsoft Flight Simulator as an actual flight instructor. Then, we'll take him up in a Cessna and see how much he's learned. Will Paul live to write about his experience? Stay tuned.

The Toughest Floppy Disk in Town

How tough are floppy disks? Howard Karten will torture a set of floppies to find out. Will the disks stand up to moisture? Sound? Fingerprints? Coca Cola?

Offbeat Accessories

Diskette stands, micro-perforation paper, and blank function-key templates are just some of the unusual yet useful accessories to be reviewed in this article. Some of these offbeat add-ons just might make using your PC more productive.

Micros for Migrants

PCs are being used in a national campaign to aid in the education of thousands of children from migrant worker families. We'll look at how PCs are being used both as an administrative and as an educational tool.

Professional tools for the software developer and business system user.

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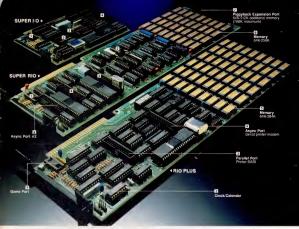
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